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GAS JOURNAL

LIGHT • HEAT • POWER • BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

Vol. CLXV. No. 3166.] LONDON, JANUARY 16, 1924. [76th Year. Price 1s.

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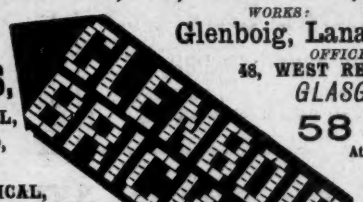

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VOL. CLXV., No. 3166.] WEDNESDAY, JANUARY 16, 1924. [76TH YEAR.

EDITORIAL NOTES.

The New Spirit.

THERE is a new spirit abroad in the gas industry. We welcome it, because it is the right one, and it will benefit the industry by helping it to heights in service and stability which could not be attained alone by the individual efforts of the units constituting it, though those efforts might carry them a good distance, but far short of the ultimate stage realizable by endeavour of a unified and co-operative order. The memories of many of us go back to those times when the constituents of the gas industry were as comparatively small floating entities, had no outward identity one with the other, and were in no wise organized other than through the technical men, who suffered severe restrictions in their operations owing to the complete absence of an interest outside an individual concern on the part of those upon whom administrative gas functions devolved. A complete change has come over the scene, and to the immeasurable benefit of the industry. The executive officers of the industry frankly and freely acknowledge that it is also to their own benefit, in that the new spirit is helpful to them in these times when the responsibilities and needs of management are ever on the increase.

We were impressed by this change of spirit when writing the paragraph last week [p. 79] on the gratifying response to the appeal for contributions to the British Empire Gas Exhibit Fund. The subscriptions and promises have, we learn, so far flowed in well; and we are hoping, in view of this good witness to the new spirit, which has a weighty and far-reaching operative power in the industry to-day, that the remaining thousands of pounds required will soon be added to the accumulation already made. We recall, as we are writing, days long ago, when for some good purpose we were exercising pen and brain in an appeal for money, and the response took the form of driblets, and wide apart; and there was much disheartening for those who were the prime movers in a laudable object. Times have changed in the industry; and so fortunately have men's ideas. It is interesting to examine the causes of this. We unstintingly award honour for this first to the British Commercial Gas Association, and of late years to the National Gas Council, which have been the means of bringing together the administrators of the gas industry, irrespective of whether they are in charge of company or municipally owned concerns. Among gas companies, the Gas Companies' Protection Association have had like effect. The British Commercial Gas Association was started for the express purpose of educational propaganda in the highways and by-ways of our daily life which could not be reached so effectively by individual endeavour as by a co-operatively supported *ad hoc* organization. But it has had another effect, and so has the work of the National Gas Council. Their operations have been educative for the administrators of the gas industry. That was an unpremeditated result; but it is one which we hold is having, and will have, an enormous influence upon our industrial fortunes, in that it has produced not only the recognition of the power of co-operation, but the desire to act co-operatively in all work that bids fair to be beneficial for the industry as a whole. Until co-operative work was launched, the administrative men of the industry never knew each other, and they had no genuine or intimate conception of how intricate the affairs of the industry were. They never appreciated so fully as now the deficiencies of the industry economically and as an operative force. They never understood how much work there was to be done, and how much more could be accomplished co-operatively than individually. There was little idea of the latent potentialities of the industry. There was no clear anticipation of the competitive and hostile forces that would be brought against their undertakings; and there was no sufficient appreciation of duties as being public utility undertakings.

All this has been changed. There is new knowledge and a new spirit extant. Co-operation has been an educational force within the industry. Its influence has broadened views, and has cultivated a desire to have a hand and part in all things that will assist the industry's fortunes. This is not the growth of a day, but of a decade or more; and the belief in co-operative work in the industry is greater now and more strongly established than it has ever been during the period of its development. We hope to see further growth of the new spirit; and testimony to this will be the rapid completion of the amount required for the British Empire Gas Exhibit Fund.

Rewarding Consumers for Approved Appliances.

THERE has been much discussion regarding the question of inspection and maintenance of consumers' appliances; and, in our opinion, a great deal too much has been made of the cost of doing this, and of the extra responsibility, which has taken more or less shadowy form in the minds of some gas engineers. The alternative is loss of business through consumers' dissatisfaction with the supply and the service rendered, and that may be far more costly than an enterprising scheme of maintenance. But is there no way in which consumers can be induced themselves to take an interest in their gas-using appliances, and in maintaining them in good condition? It ought not to be beyond the wit of gas men to devise a method. In this connection, Macclesfield offers a novel suggestion, and it seems that it supplies the first step towards inducing consumers to take an interest in the type of their appliances; but we are not sure whether it will serve as an incentive to the maintenance of the condition of the appliances. We will presently revert to this point. What the Macclesfield Corporation Gas Committee have done is to adopt a sliding-scale of therm charges, with a further reduction of price if the consumer owns gas appliances approved by the Gas Engineer. We will not allude to the prepayment or power charges. Information regarding them can be obtained from last week's issue [p. 97]. The new prices to the ordinary consumers embrace the point to which special attention is asked. The charge for a quarterly consumption of less than 40 therms is to be 10d. per therm; 40 and under 100 therms, 9·5d. If, with a consumption between 40 and 100 therms, the consumer owns gas appliances approved by the Gas Engineer, then the charge will be ½d. less, or 9d. per therm, which is the same price as when the consumption is 100 and under 250 therms. The consumer in that zone also secures an additional ½d. reduction, making the price 8½d. per therm, if he or she owns gas appliances approved by the Gas Engineer. A charge of 8½d. also applies to consumptions of 250 therms and over; but here again an

extra ½d. reduction is allowed if the consumer possesses appliances approved by the Gas Engineer.

We are not aware of the conditions prevailing in Macclesfield with respect to apparatus on hire; but we assume that the ½d. reduction per therm will not apply to such apparatus, though really we do not see why it should not, if the hire charges are sufficient to cover all costs connected with the appliances. Perhaps Mr. F. W. J. Belton will supplement the information, so as to make the position clear. It is, by the way, noticed that prepayment consumers of over 30 therms who own appliances approved by the Engineer obtain a concession per therm from 10·47d. to 9·91d. It is observed that ordinary consumers seeking to come under the reduced prices for approved appliances must apply for a form and give particulars of the equipment, which must be approved before the lower price can have effect. We take it that there will be an inspection of the appliances, and that the reduction will not be allowed solely on the consumer's statement of particulars. Then, again, will the reduced price be granted permanently upon the initial approval of the appliances by the Engineer? The question is asked because appliances are not always maintained by a consumer in a condition which would meet with the approval of a gas engineer. Will there be periodical inspection, or will there simply be reliance on the good faith of the consumers to keep the approved appliances in a fit condition? Then, further, is there to be any guarantee that the privately owned appliances which are approved will not be changed for others unless also submitted for approval? These are points that occur to one in looking at the figures as published in our columns last week. We are pleased to see any scheme formulated which will act as an incentive to consumers to possess suitable gas appliances; but when a new system such as this Macclesfield one is launched, there is interest in ascertaining whether it is complete in all details, and will be effective continuously. It is, of course, something gained to know that privately owned gas appliances are such as the Gas Engineer can approve, as gas consumers are not in the habit of making frequent changes of such appliances. It is likely, too, that new gas consumers will, before purchasing appliances, be led to ascertain whether they would be approved. That would be a further gain. Of course, it may be said that, given such appliances, it will be the consumers' own fault if they are not permanently kept in an efficient condition, and that he will then be the loser. Nevertheless, while the Macclesfield system of reward through lower price per therm in the case of approved appliances is good, we are hoping to learn that the reduced price is conditional on the appliances being maintained in good order. That they are so maintained could, of course, only be ascertained by periodical inspection.

However, it may be that all these points are covered by the conditions attaching to the new scale of charges; and one object of this article is to try to draw from our friend at Macclesfield some information supplementary to that already published. Anyway, we have here an interesting innovation; and we expect to learn of good results issuing from its introduction and operation.

Lectures and Laboratory Instruction at the Leeds University.

IN a later part of this issue of the "JOURNAL," an outline is given of the arrangements that have been made, in connection with the Department of Coal Gas and Fuel Industries at the Leeds University, for the delivery during the second term of the current session of a special course of evening lectures; and we wish to emphasize the importance of the programme to the technical students of the industry—especially to those who are not full-time ones at the University. We must, in the first place, congratulate the Department upon securing the services of men to deliver the lectures of recognized authority upon the subjects with which they will be dealing, and which are all of supreme importance to the industry—never more so than to-day. We see that Mr. T. F. E. Rhead, M.Sc., the Chief Chemist of the Birmingham Corporation Gas Department, will treat of the various aspects of the carbonization of coal; while Mr. H. Hollings, who is senior gas chemist to the South Metropolitan Gas Company, will deal with gas purification practice. The subject of refractory materials will be in the hands of Prof. J. W. Cobb; and no more appropriate lecturer on this topic occurs to us. The physical properties of refractories have been entrusted to Mr. H. S. Houldsworth, M.Sc., Research Assistant and Assistant Lecturer on Refractory Materials at the University. Passing to utilization, Mr. J. W. Wood, M.Sc., well known to all gas men as Research Chemist to the Joint Research Committee of the Institution of Gas Engineers and the Leeds University, will lecture on the aeration of gas-flames. A very useful feature will be the evening laboratary courses, which will be undertaken by Prof. Cobb, Mr. Hodsman, and Mr. Summers. The evening courses should be exceedingly popular; the fees are of a modest order.

We hope these courses of lectures will be highly successful in point of numbers of students; with respect to value, they are bound to be. They have been deliberately planned with a double object. In the first place, from the outside they draw lecturers with special knowledge of their subjects from day-to-day contact with them. This is very important, as in this way the Department is able to supplement the courses of instruction to the degree students in a manner which everybody, in our opinion, must admit is very desirable and beneficial. There is, however, a second object in view; and it is to make the University of Leeds a centre where special lectures are available not solely for full-time students, but for all members of the industry desiring the benefit of such facilities. It is for this purpose the lectures are given in the evenings—a very unusual proceeding for lectures forming part of a degree course—and it is for the same reason that they are arranged so that two lectures can be attended in one evening at the University, and therefore by one journey to Leeds, which facilitates attendance from a distance.

In the past there has been one disappointing feature in connection with these courses of lectures. We know that some of them have been well attended by students from all parts in the North; but, at other times and other lectures, the attendance, in respect of students from outside the University, has been unsatisfactory for all concerned. We recall one such course which was excellent from both the scientific and the practical standpoints. The preparation of the lectures must have absorbed a considerable amount of time and claimed a great deal of trouble. They were, we are well aware, much appreciated by the full-time students, and no doubt also by those who attended from outside; but of these unfortunately there were very few. This lack of appreciation of certain lectures must be very discouraging, not only to a lecturer who has taken great pains over his subject, and has probably travelled far, but to the University whose expenditure in this relation is not of a light order. Efforts and plans are directed by the University authorities to keeping abreast of the times, but on some occasions their interest receives little rewarding response. We hope that every opportunity provided by the programme for the second part of this session will have a signal success in respect of numbers. We do not desire to be misunderstood. The courses are fully justified and necessary because of the important part they take in the training of the full-time students; and, after all, it is to them that the chief teaching function of the Department of Coal Gas and Fuel Industries is directed. But we should like to hear that the facilities afforded by these courses to students who cannot from any circumstance enrol themselves as full-time ones were being taken advantage of by many more. It may well be that the numbers will be materially enlarged with the growing insistence in the industry on educational work in the science of gas engineering. At any rate, we sincerely hope it will be so.

Under the Socialist State.

ACCORDING to Mr. Herbert Morrison, who is a member of the London County Council, and an ardent believer in the efficacy of the policy of the Labour Party to create a new heaven upon earth, the lot of the working man's wife is a hard one; and one of his plans for improving it is to supplant coal and gas by electricity. If coal and gas were abolished and electricity took their place for all purposes in four or five million working men's homes, the nation would have the spectacle of their coal resources diminishing at a much faster rate. The uneconomy for the working man would be so immense that the chances are there would be considerably more work for the county courts, and the number of homes that would be in a state of financial impoverishment would be so great that in the later life of the people the demands upon the workhouses would be much enlarged, unless old-age pensions were amplified. In this event, under the Socialist State, ways and means would

have to be found for heavily increasing the national revenue. We gather from his pamphlet on "Better Times for the Housewife," that Mr. Morrison is a dreamer and a visionary, with a capacity for examining things superficially, without, like a bad engineer, giving much thought to the foundations and to the whole gamut of the effects of what he proposes. However hard may be the lot of the working man's wife in some places, there are a few millions who would be able to tell Mr. Morrison that, so far as domestic labour is concerned, it is not nearly so bad as it used to be before the conveniences of gas and the gas-cooker came to their aid.

There is very little in what Mr. Morrison says about electricity as a labour saver that does not apply to gas, and more so. He is, in fact, very late in the day with his proposals—the only difference between him and actual and successful workers is in the agent he would employ. The gas industry has for some years—probably many before Mr. Morrison started to study socialistic tenets—been working to lessen human toil by introducing into the homes of the working classes means of saving labour which have a decidedly larger range of power than electricity can offer. In cooking, just imagine all the boiling operations being done by electricity. Just think of all the hot water that is required for cleanliness and drinking purposes in the working man's home—at present usually produced on the hot-plate of the gas-cooker—being boiled by electricity. The working man's wife would have her patience sorely tried by the electrical process, after being accustomed to the prompt services of gas. Mr. Morrison professes to know a good deal about household duties. Just let him think of a mother, wishing to bath her children, waiting for the water to be heated by electricity! Again in room heating, let him think of a 2 KW. fire, costing 3d. or 4d. an hour, and multiply that by the hours of use. It is all too quixotic.

Mr. Morrison quotes "concrete facts" from the Hackney municipal electricity undertaking in connection with electricity costs in "certain working class maisonettes." In these the consumer pays 8d. per week for lighting, and 1½d. for heating; and Mr. Morrison says in actual experience, during two-and-a-half winter months, lighting has cost 12s. and cooking 11s. 6d. Mr. Morrison ought to know better than to quote such figures without giving information as to the work that is done for the latter figure. He will admit, we think, that one cannot get more energy out of any heating agent than there is in it; and he will agree with us that there are no cooking operations in which electricity can be used at 100 p.ct. efficiency. The 11s. 6d. would, at 1½d. per unit, buy 92 units of electricity, by which 314,640 B.Th.U. can be developed. Is Mr. Morrison aware that this is the potential heating value of, approximately, 26 lbs. of coal and of 629 c.ft. of 500 B.Th.U. gas? If coal were used at only 20 p.ct. efficiency and electricity at 100 p.ct. (which is absurd), 130 lbs. of coal would do the same work as the 11s. 6d. worth of electricity. Very little cooking work, as we know it in connection with the gas-cooker, could have been done by that expenditure on current, spread over two-and-a-half months. And this is the sort of thing with which Mr. Morrison backs the pretty piece of imagination as to what electricity can do for the working woman, but which gas is already doing, and that much more economically from the two standpoints of the conservation of our national coal resources and of the pockets of the consumers. All through the pamphlet, his diaphanous knowledge as to relative efficiencies, &c., projects upon the technical reader; and this the Labour Party considers good enough for the education of the working class. If this is how they would proceed with a constructive policy, then it is obvious that it should be the aim of every intelligent individual to do his or her utmost to keep them in a position where they can do no harm to our national and domestic interests.

More comment on the pamphlet will be found in a contributed article in another part of this issue; but we will not leave this piece of fiction without mentioning that the preface is written by the late President of the Miners' Federation (Mr. Robert Smillie, M.P.). It is the product of the miners which creates so much labour in the home when burned in the raw state. It should be Mr. Smillie's desire to see that product used in the way which will produce the most material profit for the country; and that is not the electrical way, so far as domestic purposes are concerned. As a labour leader, too, it should be his wish to see coal used industrially in the way which will give the maximum employment—as between the production of gas and electricity the former in this respect leads the way.

Electrical Interpretation of Gas Progress.

ONE of those singularly illogical comments on gas affairs which are occasionally seen in the electrical papers has appeared in "Electrical Industries." It deals with the editorial article in the "JOURNAL" for Jan. 2, on "A Notable Financial Slide." It quotes accurately the receipts and expenditure of the statutory gas undertakings for 1922, both of which (for reasons which we gave in the article in question) showed during the year a tremendous recession; nevertheless the result was a gross profit of £11,427,216, as compared with £5,789,295 in 1921. We remarked that this was good business. Our contemporary grudgingly admits that "up to a point" it "supposes it is;" but it adds: "An industry which achieves a notable financial slide by reducing its tariffs is hardly in a condition to congratulate itself heartily." Certainly it is, if the business has increased and its profits are greater. It goes on to argue that in a progressive business the effect of lower prices is to increase revenue by adding to the number of consumers and to the average consumption. In these times of abnormal conditions, a progressive business is one which can sell at a lower price, increase its customers, its aggregate and its average business, and make an enlarged profit. All this the gas industry did in the year to which the data refer. In the circumstances, judgment as to progress cannot be based upon revenue; it must be upon profits and the business actually done.

Our contemporary also submits that prices have come down in the electricity industry in at least the same proportion as in the gas industry; there has been no "cutting" of expenditure; and the surpluses have materially advanced as a result of ever-increasing demand. Nobody else has suggested there has been cutting of expenditure in the gas industry. The reduction of expenditure is due to the lower costs of coal, oil, and other materials, labour, rates and taxes, and the fact that the expenditure on repairs and maintenance during the immediate post-war years has now got down—the war-imposed leeway in these respects having been made up—to more normal dimensions, though, of course, the costs of materials and labour are still higher than before the war. Reduction of outlay obtained through easier market conditions is not usually called "cutting" of expenditure. There has been no cutting of expenditure essential to efficiency in production and service. We are rather surprised that a technical paper did not see these things; its readers who know anything about finance and the factors influencing the movements of receipts and expenditure must smile hugely over the ignorance displayed. Probably prices in the electricity industry have come down in proportion to those in the gas industry. But the reductions are not, in the main, due to any general increase in efficiency or to a striking advance in the number of consumers, or in the aggregate consumption; as in the gas industry, they are chiefly due to cheaper coal, materials, labour, and so forth.

One more point. Our contemporary, being in belittling mood, seems to regard an increase in gas business of 3,525,677,000 c.ft. in a year as something of an insignificant nature. Probably his mind is incapable of grasping the meaning of such figures. He uses them for the purpose of dragging in the sneering comment that "this increase has not been sufficient to maintain the progress which one would expect for an industry which sells a commodity which is, according to its own veracious authorities, three times cheaper than electricity." Perhaps one should pity rather than criticize the author of such comment. But as he does not think much of the progress, and as another electrical journalist the other day was referring to the gas industry as moribund, perhaps a few more data will help them to understand that their opinions are much opposed to actual facts, and so exceedingly foolish. Official statistics (which exclude non-statutory concerns) show that the aggregate receipts of the gas industry in 1913 were £35,503,558; in 1922, £70,626,651, or £35,123,093 more. The expenditure in 1913 was £28,242,104; in 1922, £59,199,435, or £30,957,331 more. The gross profit in 1913 was £7,261,454; in 1922, £11,427,216—a difference of £4,165,762. The sale of gas in 1913 was 206,474,473,000 c.ft.; in 1922 (despite industrial depression), 232,602,789,000 c.ft.—an increase of 26,128,316,000 c.ft. The average annual increase during the ten years has therefore been 2,612,831,000 c.ft.; the increase in 1922 upon 1921 was 3,525,677,000 c.ft., or 912,846,000 above the average. The number of consumers in 1913 was

7,103,113, and in 1922, 7,672,146—an increase of 569,033. Can "Electrical Industries" appreciate the significance of these figures? If not——well, we will extend to it our deepest sympathy.

National Gas Council.

The minutes of the last meeting of the Central Executive Board of the National Gas Council, as is seen elsewhere in this issue, disclose several matters which are under consideration. One question has been carried to a successful conclusion. As an announcement which appeared in our columns on Jan. 2 showed, the representations of the Council have secured modifications in the terms upon which the Unemployment Grants Committee are now authorized to render assistance to gas undertakings. It was as far back as October last that the Council made suggestions for these modifications; and the decision has virtually given effect to them. The difference with the railway companies as to new supplies of gas from mains of insufficient capacity is still under discussion. The draft specification as to model by-laws and regulations for the prevention of the contamination, waste, and misuse of water has yet to be finally approved; but before this is done the Council will have an opportunity of making further representations. Railway rates and shipping facilities are other topics that are being closely followed up.

Meter Testing Stations.

Under consideration, too, by the Central Executive Board, is a matter of importance to gas undertakings which are not situated in fairly close proximity to meter-testing stations. Large sums are involved in the carriage of meters between the works of such undertakings and the nearest meter-testing station; and, moreover, it is naturally a disadvantage to the meters themselves to have to undergo an unnecessary amount of transport. More testing stations are required, as is an amendment of the law regulating this matter. The Central Executive Board of the Council are pursuing inquiries into the subject, to ascertain what (if any) line of action can be taken.

Electricity and Street Explosions.

Electricity, as is now well known, is primarily responsible for many of the explosions which take place in the roadways and footpaths of our cities and towns. Its operations are of a peculiarly clandestine nature. Last week a short news paragraph appeared on p. 94 of the "JOURNAL" as to an explosion which occurred in St. Martin's Lane. The notice made it seem that ordinary gas was the sole cause of the double occurrence. Inquiry puts another complexion on the matter. The facts appear to be that an explosion took place in the underground chambers of the Charing Cross (West End and City) Electricity Supply Company, Ltd., just after midnight on Monday last week, which, besides doing other damage, incidentally displaced the brickwork of a manhole entrance to one of the chambers—viz., that opposite the Duke of York's Theatre. The displacement of the brickwork fractured a 6-in. gas-main which lay alongside of it, and the escaping gas was fired, presumably by a spark from a defective cable. There is no evidence whatever leading to the conclusion that the original explosion was due to coal gas. On the other hand, everything appears to point to the explosion having been caused by bitumen gas from the defective insulation of the electric cable.

Japan's Purgatory.

We have reprinted from "The Arc" correspondence in which the *amende honorable* is made in respect of the matters to which we took exception, on behalf of the gas industry, and which appeared in a paragraph under the above heading in Messrs. J. Halden & Co.'s publication.

Gas-Fires and Air Pollution.

It gets a little tiring to have opinions expressed in public prints, without proof, as to the misdemeanours of gas. There has been a good deal of this postulation lately, and that by the partizans of some other means of doing those things for which gas is a valuable agent. According to the extract of a letter to "The Times," Mr. David Brownlie wrote: "When coal is carbonized, whether by low-temperature or high-temperature methods, nearly all the harmful volatile sulphur is driven off in the process, and much of the costly plant necessary in a gas-works is due to the fact that the gas companies are compelled by law to extract this sulphur from the gas. Similarly, a low-temperature fuel is almost devoid of sulphur, and would give, like coke, only a fraction of the acid sulphurous gases from raw coal, in which the sulphur content varies from (say) 0·9 to 2½ p.ct. The wholesale use of gas-fires, even if it was practicable because of the impossible price of gas, would, in my opinion, actually increase the fouling of the atmosphere by the unburnt and partially burnt gas that escapes in the ordinary gas-fire. The real remedy is low-temperature fuel in the households, universal electric lighting, and the use of low-temperature fuel in the pulverized condition at the electricity stations." Regarding the first part of this statement we have no complaint to make. As to the second part, notwithstanding the so-called "impossible price" of gas, undertakings have never been busier than of late with fixing fires. As to Mr. Brownlie's "opinion" that the wholesale use of gas-fires would "actually increase the fouling of the atmosphere by the unburnt and partially burnt gas that escapes," if this were true we should never get from such fires the efficiencies that many well-known authorities have found from actual test. We will not discuss the matter until something positive is obtained from Mr. Brownlie. Therefore we will ask him to supply us with complete analyses of his own making of the waste products from a gas-fire, the chimney products from a domestic coal-fire, and from a fire using low-temperature coke—the last at different stages from lighting-up. He no doubt has such analyses by him; otherwise his "opinion" would have no foundation.

Miners' Wages Agreement.

At the time of going to press, it looks very much as if there will be a heavy vote by the miners in favour of giving three months' notice to terminate the national wages agreement. It is stated that the returns already to hand show that North Staffs, Leicestershire, Northumberland, Durham, West Stirlingshire, and Dumbartonshire, have voted for termination. The votes of forty-one branches of the Northumberland Association show 10,853 for giving notice to end the agreement, and 4063 against. This does not look very hopeful; but the three months' notice to terminate the agreement does not necessarily portend a strike. The notice is quite in accord with the provision made at the time the agreement was entered into. It means that a fresh agreement will have to be made; but if acceptable conditions for a new agreement cannot be arrived at—well, then it may occasion a further ballot, the consequences of which might not be of a happy order.

Threatened Railway Dislocation.

A matter of more immediate concern is the trouble in connection with the enginemen, or a large proportion of them, on the railways. The railway companies have declined to make any concessions on the revised rates of pay arrived at by the National Wages Board, which have been accepted by the National Union of Railwaymen and the Railway Clerks' Association. The Associated Society of Locomotive Engineers and Firemen have, however, refused on a ballot showing a five-to-one majority to accept the decisions of the Wages Board, but of the 59,000 members of the Society nearly half refrained from voting. There is now talk of a lightning strike at an unknown time—Sunday night is suggested. But the General Council of the Trade Union Congress have stepped in; and people are looking hopefully to their being able to exercise their influence in preventing the dislocation of the country's traffic, which would be inevitable by the withdrawal of such a large body of the primarily essential workers on the railways. Of course, there are a considerable number of drivers and firemen in the National Union of Railwaymen, so that the dislocation would be partial, and not complete.

A Blow at Conciliation.

An uncomfortable reflection is that this important Society are proposing to strike a serious blow at the railway conciliation machinery, over the construction of which so much time was spent a few years ago. The proposals and decisions from which the trouble has arisen have been through all the stages of conciliation—preliminary consideration by the managers and representatives of the trade unions, the Central Wages Board, and

the National Wages Board. The findings in this instance were agreed to and accepted by all the constituent parties on the Wages Board—including the representatives of the recalcitrant Society. One labour authority writing on the subject truly says: "If a unanimous finding of all the parties is to be set aside by strike action taken by one of the assenting parties, then the present conciliation machinery is practically scrapped." Such a Society ought to set a better example in constitutional procedure.

Traders' Co-ordinating Committee's Appeal.

From the Federation of British Industries we have received a copy of a letter issued by the Traders' Co-ordinating Committee, who have for some time past been representing the interests of the traders as a whole in the various negotiations and inquiries which have been taking place under the Railways Act, 1921. As the Railways Act provides for a complete revision of the whole railway system of the country (extending not only to organization but to charging powers, conditions of carriage, and many other matters), it is clear that the work of the Committee is of the very first importance to the industry and commerce of the country. They are appealing to the users of the railways for a fund to assist them in conducting the final stages of the inquiry on the subject of the new standard charges now pending before the Railway Rates Tribunal. The fund will be under the direction of the General Purposes Committee of the Traders' Co-ordinating Committee, consisting of nominated representatives of the Association of British Chambers of Commerce, the Federation of British Industries, the Mansion House Association on Railway and Canal Traffic, the Traders' Traffic Conference, the National Chamber of Trade, the Incorporated Association of Retail Distributors, the National Federation of Fruit and Potato Trades Associations, and the National Farmers' Union. The Committee ask that contributions should be sent to Mr. R. L. Drage, Federation of British Industries, 39, St. James's Street, S.W. 1; and cheques should be made payable to Sir James Martin. J.P., Honorary Treasurer, or "Bearer," and crossed Lloyd's Bank Limited, St. James's Street Branch, London, S.W. A decision has to be taken, at the latest within the next few weeks, whether the Companies' proposals are to be contested (as the Committee most strongly feel they should be); and therefore prompt contribution should be made.

PERSONAL.

Mr. FRANK GOODWIN, Assistant to Mr. S. O. Stephenson, Engineer and General Manager of the Worthing Gas Light and Coke Company, has been appointed Manager of the Kowloon Works of the Hong Kong and China Gas Company.

At a social gathering at Stockton-on-Tees, at which the staff of the Corporation Gas Department were the guests of Mr. W. W. Atley (Engineer and General Manager) and Mrs. Atley, drawing instruments were presented by Mr. Atley, on behalf of the officials and staff, to Mr. W. A. DOBSON, who is leaving Stockton to take up the position of Assistant Gas Engineer at Ilkley.

Representatives of the men employed by the Stanton Ironworks Company, near Nottingham, have presented to the Managing Director of the Company, Mr. E. J. FOX, a gold cigarette case, inscribed as follows: "Presented to Mr. E. J. Fox, the Managing Director of the Stanton Ironworks Company, Ltd., by the Six Executive Committees representing 14,000 British Working Men as their appreciation of his efforts towards bridging the gulf between 'Capital and Labour.' Jan. 5, 1924."

We hear that Mr. WILLIAM BATT, Sen., Northern Manager of Messrs. Thomas Glover & Co., Ltd., retired at the end of last year, after 50 years' service with the firm. We hope he will enjoy many years of well-earned leisure. His duties will be divided in future. On the sales side he has been succeeded by Mr. A. G. WILSON (whose many friends in the North of England will be pleased to hear of his appointment), and on the works side by Mr. J. S. WILSON, who has been for many years at the Edmonton factory of the firm. and who, in recent times, was Chief Assistant in their meter department.

Southern Association of Gas Engineers and Managers (Eastern District).—The next meeting of the Eastern District of the Association will take place at 2.30 on Thursday, Jan. 24, at the Institution of Gas Engineers, No. 28, Grosvenor Gardens, S.W.

Illuminating Engineering Society.—A meeting of the Society will be held at 8 o'clock on Tuesday next, Jan. 22, at the Royal Society of Arts, when Mr. J. S. Dow will open a discussion on the "Co-ordination of Research in Illuminating Engineering, and Some Practical Examples."

OBITUARY.

THOMAS SETTLE.

It is with deep regret that we have to announce the death, suddenly, at Plymouth, last Saturday, of Mr. Thomas Settle. The cause of his decease was a seizure, but happily the end was peaceful.

Sixty-four years of age at the time of his death, Mr. Settle started his working career as an apprentice in a Huddersfield engineering establishment, and thus acquired good constructive knowledge. While still a young man, he was appointed, in 1885, to the management of the New Mill Gas-Works, near Huddersfield; and after spending eight years there, he took technical charge of the Knaresborough Gas and Water Works. This appointment was followed three years afterwards by that of Resident Works Superintendent and Assistant to Mr. W. A. Padfield, then Engineer and Manager of the Exeter Gas Light and Coke Company; and here the "Settle-Padfield" vertical retort was evolved. This was about 1900, and in 1902 the invention was patented.

It is, of course, in connection with his enthusiastic work on carbonization for economical production of gas that "JOURNAL" readers will always remember him, but proof of his inventive genius is to be found also outside the gas industry. Even while at New Mill he was operating a device for feeding horizontal retorts in small quantities, which is said to have produced remarkable results; and his investigations included also the heating of retorts. Prior to the introduction of his vertical retort, he was engaged in steaming ordinary horizontals. The main points of the patent specification, with illustrations, relating to the Settle-Padfield modified vertical retort will be found in the "JOURNAL" for June 16, 1903 (p. 807). Many gas men will, without reference to this, recall the peculiar shape of the retort—the top half vertical, and the bottom curving away at an angle of 45°, with a lateral discharge—with which the pioneer experiments were carried out at the Exeter Gas-Works, and from which results were produced with different classes of coal that were equal in quantity of gas, in thermal value, and in liquid products, to any of those working with the more modern forms of vertical retorts before the advent of steaming. In the Settle-Padfield system, the retort was not charged fully to the top. There was a space left, and by means of a feeding hopper fresh additions were made to the charge at frequent intervals. This dropping of the fresh coal on to the incandescent surface of the coke in the retort caused the meter through which the gas produced was passed to make rapid intermittent registration. Mr. Norton H. Humphrys, of Salisbury, devoted much time and attention to the results attained in the preliminary trials of the system at Exeter; and he contributed to our pages an interesting descriptive article, which will be found on p. 881 of the issue dated June 23, 1903. Subsequently, the late Prof. Vivian B. Lewes was called in as consultant, and presented the gas industry with many tests of working with the original retorts.

It was a great grief to Mr. Settle that he was not at that period in a position to exploit the invention, and meantime the Woodall-Duckham and the Glover-West systems made their appearance, and quickly secured popularity among gas engineers. Subsequently—in about 1911—he entered the service of Messrs. Leech, Goodall, & Co. (later Messrs. Goodall, Clayton, & Co., Ltd.), of Leeds, and was engaged for nine years as their representative on vertical retort work in all parts of the country. Then, in consequence of heart affection following two attacks of influenza, which made it advisable for him to avoid long hours of work and active physical exertion, Mr. Settle decided to remove from Yorkshire to the South Coast, but to retain the advisory connection that he had established while with the Leeds firm. Unhappily, however, the great ability that he had shown in the early days of his original vertical retort at Exeter did not bring him that material reward which unquestionably was his due. Some of his friends frequently hinted that he should have been the recipient of the "Birmingham Medal" of the Institution of Gas Engineers, but this honour never fell to his lot.

The volumes of the "JOURNAL" have been enriched by the inclusion of a number of articles upon the subject of carbonization from the pen of Mr. Settle. In 1915, he was elected a Fellow of the Institute of Inventors; it being stated on that occasion that he had been concerned with patents taken out for no less than 26 countries besides Great Britain. In this connection, it may be mentioned that the "JOURNAL" for Nov. 12, 1918 (p. 356), contained a review of preliminary working tests of the downward-steaming process for intermittent vertical retorts, of which Mr. Settle and Messrs. Goodall, Clayton, & Co. were joint patentees. Later, on account of his knowledge of the minerals of Devonshire, he was made a member of the Council of the Mineral Development Association, which had been established to promote the development of mineral resources at home and abroad. The Institution of Gas Engineers, at their meeting in October, 1921, elected him an honorary member—Mr. Thomas Goulden (as President) remarking that Mr. Settle was undoubtedly one of the pioneers of vertical retorts, and that it was his work at Exeter, which was followed by others, which had provided the industry with the later developments in this direction This sentiment found echo in the audience.

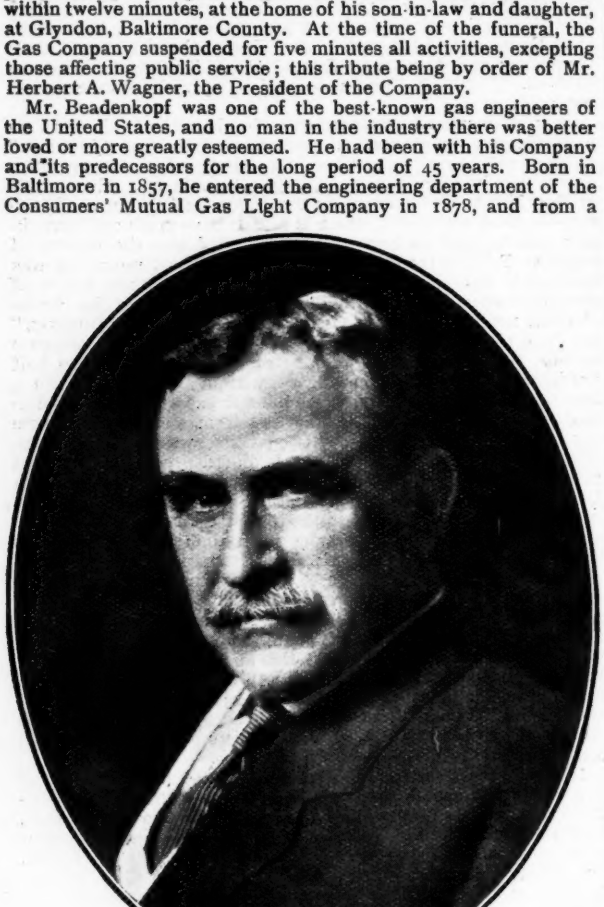
We part sorrowfully with an old friend with whom we kept

in very close touch over the many years during which he had been an active worker on the technical side of the gas industry.

GEORGE BEADENKOPF.

With ourselves, many other personal friends in this country will be sorry to learn of the death on Christmas Day of Mr. George Beadenkopf, Chief Engineer of Gas Operations of the Consolidated Gas, Electric Light, and Power Company of Baltimore. Having a distinguished career as a Gas Engineer in the United States, he frequently came over to this side to make himself acquainted with the latest practices here, and on these visits to his brother engineers he never failed to call at the offices of the "JOURNAL," to which he often communicated interesting news items. Deceased, who was 66 years of age, had a stroke of apoplexy shortly after partaking of his Christmas dinner, and died within twelve minutes, at the home of his son-in-law and daughter, at Glyndon, Baltimore County. At the time of the funeral, the Gas Company suspended for five minutes all activities, excepting those affecting public service; this tribute being by order of Mr. Herbert A. Wagner, the President of the Company.

Mr. Beadenkopf was one of the best-known gas engineers of the United States, and no man in the industry there was better loved or more greatly esteemed. He had been with his Company and its predecessors for the long period of 45 years. Born in Baltimore in 1857, he entered the engineering department of the Consumers' Mutual Gas Light Company in 1878, and from a



George Beadenkopf.

minor position rose, through application, industry, and ability, to the high post which he occupied from 1902 to the time of his death. For about twenty years prior to 1902 he was Assistant Engineer to the Consolidated Gas Company. With Mr. Alten S. Miller, who was Vice-President and General Manager of the Consolidated Company from 1902 to 1909, he was responsible for the building of the modern gas plant at Spring Gardens. The present plants and the distribution system are the work of Mr. Beadenkopf and the engineers who had the privilege of working with him and benefiting from his comprehensive knowledge, the wise judgment which grew out of his wide experience, and his thoroughness. An illustrated description of a 10-million holder erected at the Spring Gardens Station appeared in the "JOURNAL" for Jan. 4, 1922, p. 26; and going farther back, we notice a number of other references to this progressive undertaking.

The death occurred on the 31st ult. of Mr. JOHN GLASBROOK, J.P., who had for a long period been Chairman of the Swansea Gas Light Company. Deceased was 74 years of age. The interment in Oystermouth Cemetery and the memorial service at Sketty Church were both largely attended.

The death has occurred of Mr. ALFRED JAMES EDWARDS, aged 74 years, who for over fifty years was Secretary and Manager of the Taunton Gas Company. He retired in 1919. The prosperity of the undertaking during his long term of management was in no small measure due to his energy and ability.

Plymouth and Stonehouse Gas Light and Coke Company have lost their esteemed Vice-Chairman and oldest member of the Board of Directors by the death of Dr. JOHN HENRY SQUARE MAY, J.P., which occurred, in his 87th year, on Tuesday, at his residence, Melford House, Plymouth. Dr. May, whose family have been associated with the Company since its inception in 1845 (his father, the late Mr. John May, being one of the founders of the undertaking) had witnessed great developments in the concern since he first became a Director in 1887. A large gathering, representative of many phases of public and social life in the town, assembled in St. Andrew's Church on Friday, where a service was held prior to the interment at Efford Cemetery. The Rev. H. M. Harvey (a son-in-law of the deceased gentleman) and the Rev. W. H. Sharp officiated.

ELECTRICITY SUPPLY MEMORANDA.

The Past Year.

LOOKING back over the past year, there is one thing regarding which electrical journalists are agreed. It is that steady progress was registered by the electricity supply industry—probably nothing much of which to boast, but still that sort of advance which supplies a firm foundation for future progress. We are not sure which factor is taken as an evidence of progress. Perhaps it is the quantity of electricity generated. One of our contemporaries states that the statistics of the Electricity Commissioners show that in the year 1922-3 the electricity generated exceeded by 17·3 p.ct. the output of the former year; and it thinks there is no reason to suppose that during the year which has just closed the rate of progress has not been maintained. The question is, was the 17·3 p.ct. actual progress, or was a large part of it recovery? Because as there is a revival of industrial activity, naturally the consumption of electrical energy will exhibit an increase on the year before. In many of the industrial areas, the central station engineers now realize more than they did in pre-war days how quickly responsive their output curves for lighting and power are to local depressions in, and accessions to, industrial activity. To obtain a true test of advance in these times, it is better to take (say) the past four quinquennial periods, and then compare them. When we get into more normal times, then annual comparisons will be more effective and reliable in their indications.

Electric Cooking.

Glancing over the past year, the writer of "Cooking and Heating Notes" in the "Electrical Times" is so pleased with what he sees that he regards the prospects for 1924 as good. He finds evidence of a greater interest and enterprise among station engineers. We are afraid he cannot say that this is general. We have known of some engineers who have shown both interest and enterprise in connection with domestic electrification, and have in the result done their undertakings no good. The "reward" has not always been commensurate with the expenditure occasioned by the enterprise. But it seems that the efforts of manufacturers and contractors cannot be of much avail in domestic cooking and heating without preferential tariffs and hire and hire-purchase facilities. In other words, the much bolstered-up virtues of electric cooking and heating are not alone effective in promoting business, but require external support. This is perfectly obvious to all but the mentally blind; and the fact that it is necessary to charge a price per unit so much below the altitude of the lighting unit shows the difficulty of the situation. Even then the B.Th.U. supplied for a given sum, taking into account also the efficiency of utilization, leaves electricity still dangling on the fringe of the cooking and heating business, from sheer inability to offer the same value for money as other heating agents, and because electric apparatus and its paraphernalia are more costly than the equipment of its principal competitor, and not anything as reliable. However, it is well to be cheerful; and the writer of "Cooking and Heating Notes" is so because he is convinced that it is clear "from the practical results obtained recently in a dozen or more different areas that the electric cooking and heating business can be had for the asking. It is only necessary to proceed about obtaining it in the right way." For the past twenty years or more, the men of the electricity industry have been "asking" for the business; and does our friend mean to insinuate that they have only just found out the right way of proceeding about it? It seems to us that if it can be "had for the asking," electrical managers need not trouble about anything more. Simply ask, and the business is yours. What could be easier? But the practical manager, experienced in dealings with his local public, knows that there is such a thing as the stretching of imagination. The same writer, however, accuses "a number" of station engineers and others of not being up-to-date. Apparently they do not read his notes; for he says that there is evidence to show that they do not yet appreciate the progress made in recent years in the design and construction of electric cookers. Their design is simpler than formerly; mechanical construction is on a higher plane; and boiling-plates can now be relied upon to maintain their initial high efficiency in everyday use, and further to combine quick service with reasonably long life. We should like these statements to be put into something more concrete; particularly the one

as to the maintenance of the initial high efficiency of boiling-plates. We are naturally sorry that there must be disagreement with the writer; for there is a large experience which is not quite what he represents it to be, unless the boiling-plates of which users have given an account of their bitter trials, through fissuring and deteriorated efficiency, have all happened to be wrongly designed and constructed. That is unthinkable.

Heating Rooms and Water.

The same writer has something to say about electric heating. The opening passages in this section are delightfully funny when one compares in any residential area the extent to which gas heating has been adopted with the patronage accorded to electric heating. However, this is what the writer says: "The popularity of electricity for heating is a thing gas men cannot understand. They turn from their absorbing mathematical gymnastics which (to them) clearly prove electric heating to be a hopeless proposition for all concerned, only to find that yet another supply authority has temporarily to cease making heating connections owing to the inadequacy of existing plant or cables to meet the ever-increasing demand. This, too, sometimes in areas where the existing rates would not be regarded as favourable by electrical partizans. It is really very amusing." So we find it. Our friend must have had his tongue in his cheek when he wrote those delightfully unconvincing words "absorbing mathematical gymnastics." If he does not like them, then would he take part in a comparative test with meters and all the requisite apparatus for heat determinations, and give the relative results on a cost basis for a proved heating value? We are inclined to the view that the "gymnastics" are on the side of the electrical people who are particularly skilled in shunning both mathematics and actual tests. Then the fact that supply authorities have temporarily to cease making heating connections owing to the inadequacy of existing plant or cables points to something which not a few engineers find a serious embarrassment. It is not so much the "ever-increasing demand," as the fact that the demand comes in the winter when the lighting load is the heaviest; and few station engineers would care to face a heavy capital expenditure on generating plant and cables, expressly to meet the more or less temporary heating load which has a time concentration, and for which only 1d. to 2d. per unit is obtained. We agree that "it is really very amusing" to see the manner in which electrical men try to put a good face on what is for them rather an awkward problem. It is not so bad for those concerns with a large office connection, providing the density of demand for heating does not come simultaneously with a daylight excluding fog. The writer says nothing that is heartening for electrical men regarding water heating by electricity. He realizes that it is still a problem requiring solution; and he says perhaps 1924 will bring it. The difficulties in the way of solution are heavy; and one of them is that other agents can heat water much more promptly and at a cheaper rate. A little ground may be gained by a newcomer; novelties always do find a certain amount of favour. But the test of popularity is by numbers; and people generally do not take kindly to methods which are uneconomical in both money and time.

The Exhibition Scheme.

"Meteor" of the "Electrical Times" recently had the pleasure of hearing particulars of the display scheme of the Electrical Development Association at the British Empire Exhibition from Mr. J. W. Beauchamp, the enterprising Director of the organization. The impression brought away by our journalistic friend was one of "surprise and encouragement." Considerable space, it is stated, has been taken, and the utmost is being made of it. There will be novel ideas and freshness of treatment in the whole scheme. But the main object of "Meteor" in referring to the subject was to tickle-up those concerns which are not supporting the scheme with generous hearts and hands. Many are doing so; but "there are possibly some who have not yet studied it." We take it, therefore, study is necessary to incite generous contribution. Each one's support, it appears, is to be made known; and so our friend obviously thinks that undertakings who abstain from support will be a bit shamefaced when their clientele visit the great show. We are not so sure; there are callous natures and thick skins even in the electricity supply industry. Another point in the note is that, although the exhibitis primarily the concern of the supply undertakings, the manufacturers and contractors so fully realize the value of the effort that they are contributing in kind by lending plant and apparatus, and by wiring, lighting, and equipping the stands.

Apathy and Enterprise.

In the "Electricity Supply Memoranda" for Jan. 2, there was reference to "electrical apathy" and "gas enterprise." It was based upon a complaint of Mr. R. Egerton Green; and what he had to say, although we did not agree with him in every respect, was sufficient to cause gas men to blush. There has been supplementary testimony from Blackheath in the "Correspondence" columns of the "Electrical Review." The writer states that in 1922 he purchased his dwelling-house, which had not then any electrical supply. Within a day or so, the Gas Company's representative called upon him, and followed up the visit several times to endeavour to get all the business. As the householder desired to instal both power and lighting circuits, however, he made application to the local Electricity Supply Company, who made the condition that he must pay for the mains from the road into the house, although these would remain the Company's property, and further, that the maximum power available would be 2 KW. Recently, due to great variation in illumination, and the burning-out of gasfilled lamps at periods of light load, he tested the pressure over the 48 hours of a week-end, and found the voltage at a time of heavy load dropped as low as 191, and at a time of light load it rose to 210 volts. These two facts—limitation of supply and the excessive variation in pressure of what is supplied—indicate a lack of progress and inadequate mains. The Technical Press, the writer proceeds, frequently exhorts electrical engineers to act in their own homes as pioneers for the extension of the domestic load; but he is sure many must feel as cynical as himself when they think of the shortcomings and lack of vision of the supply companies, as compared with the business enterprise of the competing gas companies. Finally, he adds that the Gas Company have reduced their price successively four times since June, 1922; but despite the lower cost of production, the Electricity Supply Company have made no reduction. The statement as to the considerable variation of voltage reminds one of the gibes of the electrical papers regarding oscillating gas pressures.

Fire and Diesel Engines.

We hate destruction of anything that is useful; and therefore we sympathize with Clacton-on-Sea over the loss of its electricity generating station, which, on the other hand, has no doubt made the local gas suppliers and fitters very busy, seeing that it is predicted that it is probable that six months will elapse before the full supply of current can be restored. The loss is estimated at £150,000. Among the plant destroyed were three Diesel engines, dynamos, and other plant. One of the engines was only installed last September. The fire appears to have been caused by the engine oil fuel stored on the place. According to the newspaper reports, the oil from one of the tanks overflowed, and was ignited in some way. One report states that it was ignited by a "gas-jet;" but we should like a little more explicit information on this point. Anyway, the fact shows that the storage of oil fuel in an electricity station is a risk. At Clacton the risk unfortunately materialized.

A Big Title, and Little Else.

We have been interested in reading the prospectus of an issue of 12,000 8 p.ct. cumulative preference shares and 12,000 7 p.ct. guaranteed at maturity (1930) first mortgage debentures (at £98 p.ct.) of the Warwickshire and South Midland Electricity Supply Corporation, Ltd. It reminds us of old times, when small gas undertakings with big-sounding names, large capitals, and small reason for calling themselves anything, were floated with prospects magnified in print with all the ingenuity that skilled company promoters possess. The writer of "Electricity Supply Memoranda" has in his private capacity received two of these prospectuses; and he had just lately quite a shoal of the Wareham Electric Supply Company's prospectuses. The promoters are apparently eager for money. The offer for sale is made by the Barford Electric Supply Company, Ltd. Electricity is generated by water power. No definite statement is made as to profits; but the average increase in receipts during the past three years has been 20 p.ct. Receipts are not profit; and one might have a 20 p.ct. increase in receipts on even a former revenue of £1. The writer of "City Notes" in the "Evening Standard" calls attention to the imposing title of the Corporation, and then mentions that Barford is a village of less than 1000 population. The "Financial Times" has been looking for Barford in the "A.B.C.," and fails to find it. We agree with the former writer that only the unsophisticated would subscribe to the venture. A point of interest is that two of the Directors of the Wareham Company (which has been the subject of criticism in the "JOURNAL")—Wilfred Burton and Emerton C. Bulk—are Directors of the Warwickshire and South Midland Electricity Supply Corporation, Ltd.

An Engine-Room Explosion.

Considerable damage, happily no loss of life, resulted some time ago from an explosion at the Olten Works. This is learnt from our French contemporary's publication of the 1922 23 report of the Swiss Gas-Works Inspectorate; and the details of the occurrence are interesting. The explosion actually took place in the compressed-air starting chamber of an engine. As originally installed, this chamber used to be pumped to 30 kg. pressure by the gas-engine itself; but of recent years it had been filled from cylinders charged to 175 kg. by a compressor. It transpired that one of these cylinders contained 2·3 p.ct. of heavy hydrocarbons; and thus the starting chamber became charged with an explosive mixture. Faulty valve closure completed the sequence of events, a flash reaching the container as soon as the engine was under way. The meter was dislodged, gas escaped from the supply pipe, spare cylinders in the neighbouring store "went up," the partition wall of the compressor room was levelled—in fact, the whole building and its contents were destroyed. Apparently it was a gas compressor which had been used to charge the cylinders—a practice strongly condemned, for the pipes, cooler, and condenser attached to the machine are always likely to contribute enough light-oil vapours to make trouble.

NATIONAL GAS COUNCIL.

Central Executive Board Meeting.

The Central Executive Board of the National Gas Council met on the 8th inst., Mr. D. MILNE WATSON in the chair.

UNEMPLOYMENT GRANTS.

It was reported that, following the interviews between the Council, the late Minister of Labour, and the Unemployment Grants Committee, an official announcement had now been made revising the conditions under which grants would be made to public utility companies in respect of approved schemes for the relief of unemployment. The modified condition is as follows:

> A maximum of 50 p.ct. of the interest at an improved rate on the expenditure incurred on such scheme for a period of years, whether out of capital raised or out of existing funds or current revenue. In cases where the period of assistance does not exceed seven years, the Committee may commute the annual interest payments by a single lump-sum grant.

This virtually gives effect to the proposal put before the Unemployment Grants Committee by the Council in October last.

GAS SUPPLY FROM MAINS OF INSUFFICIENT CAPACITY.

In pursuance of the suggestion made by the Board of Trade, it was reported that a conference had taken place between the National Gas Council and the railway companies with regard to clause 20 of an Order applied for by an Urban District Council under section 10 of the Gas Regulation Act. This clause reads as follows:

> Notwithstanding anything contained in any enactment to the contrary, the Council shall not be obliged to give from any main a supply of gas for any purpose other than lighting or domestic use in any case where the capacity of such main is, at the date when such notice is served, insufficient for such purpose or if, and so long as, any such supply would in the opinion of the Council interfere with the sufficiency of the gas required to be supplied by means of that main for lighting or domestic purposes.

The railway companies suggested that the provisions in this section should not apply to a supply of gas required by any railway company. The Board were of opinion that this suggestion of the railway companies was totally impracticable; and it was decided that a further conference should take place between the railway companies and the National Gas Council with regard to the matter.

MODEL BY-LAWS AND REGULATIONS FOR THE PREVENTION OF CONTAMINATION, WASTE, OR MISUSE OF WATER.

In accordance with the decision reached at the last meeting of the Board, it was reported that representatives of the Council had appeared before the Committee set up by the Ministry of Health with regard to the Draft Specification for Hot-Water Apparatus which it was proposed to issue with the Model By-Laws.

The amendments which had been suggested by the Council's representatives were considered by the Board, and members were asked to submit within the next ten days any further observations they might wish to make regarding this draft specification.

The Ministry of Health have promised to communicate with the Council before the draft specification is finally approved.

CONTINUATION OF EXCEPTIONAL RAILWAY RATES.

It was reported that an agreement had been reached between the Federation of British Industries and the railway companies with regard to the continuation of exceptional rates in connection with the carriage of all goods and merchandise, other than coal and coke dispatched from collieries. Particulars of this scheme will appear in the Council's monthly report, and will be circulated to members. The Council have been informed that coke dispatched from gas undertakings will fall within the ambit of the agreement made between the Federation of British Industries and the railways referred to.

It will be observed that the above settlement does not cover the exceptional rates charged for the carriage of coal and coke dispatched from collieries. This particular question is the subject of negotiations between the Mining Association and the railways. The Council are watching the matter carefully in the interests of the gas industry.

SHIPPING FACILITIES.

It was reported that the Chamber of Shipping of the United Kingdom had appointed a Special Committee to consider the question of port facilities. An opportunity had been given to the Council to put forward the views of the industry, through a member of the main Committee, and members of the Council were asked to report to the head office any suggestions they might have for the improvement of port facilities—*e.g.*, the loading and discharging facilities at ports.

FELLOWSHIP OF THE BRITISH EMPIRE EXHIBITION.

It was reported that a fellowship of the British Empire Exhibition was being organized, and that the Prince of Wales had consented to act as President. The objects for the fellowship, in addition to the general purpose of advancing empire trade and production, are: Imperial education and better distribution of the Empire's population. It is proposed that the fellowship should carry out a scheme of Imperial education, and that a number of Empire scholarships should be available for citizens of the United Kingdom to settle in the Colonies. Citizens of the Colonies will also be enabled under this scheme to take a university course or to receive technical education in the home country.

It was resolved to draw the attention of members of the Council to this fellowship.

TESTING AND STAMPING OF GAS-METERS.

It was reported that a number of undertakings were put to considerable expense by reason of the fact that the nearest official gas-meter testing station was at a considerable distance, and it was necessary to pay large sums upon the carriage of meters between the gas-works and the meter testing station. The question was asked as to whether local authorities had power to provide meter testing stations, as it seemed ridiculous that meters should have to be sent over miles of railway for the purpose of testing and stamping. It was pointed out that the Sales of Gas Act, 1859, which provided for the establishment of meter testing stations, was a very involved piece of legislation, and unless the county borough had adopted the Act within the period prescribed therein, they could not do so thereafter. The result was that county boroughs which came into existence after that date had no powers whatever in this matter. The question was dealt with in the minutes of evidence given before the Royal Commission on Local Government, when it was suggested that, when Parliament could find time to do so, it was desirable that the law regulating this matter should be amended.

After discussion, it was decided to ascertain from members of the Council how the position affected them, and to consider the question further.

INSTITUTION OF GAS ENGINEERS GAS INVESTIGATION COMMITTEE.

Correspondence on the Ninth Report (Aeration and Air Injection) and Tenth Report (Blue Water Gas).

NINTH REPORT.

Mr. JAMES W. WOOD, regarding the Ninth Report, writes:

The only point that would seem to require comment is that arising out of the communication from Dr. Lessing which appeared in the "JOURNAL" for July 11, 1923, p. 259. His action in calling our attention to the work of Pfotenhauer is appreciated; and through the courtesy of Dr. Lessing in placing at our disposal the necessary periodicals, we have been able to make a detailed study of the papers in question. It would be out of place to summarize the papers here, beyond pointing out that they contain an elaborated mathematical treatment of air injection in the simplest possible type of bunsen burner.

It is there found that the simplest aeration formula given by Dr. Lessing and mentioned in our report—viz.,

$$q = k\sqrt{\frac{d}{d_1}}$$

—results from the successive introduction of simplifying assumptions into a very complex formula.

Clearly, before applying the formula, it is necessary to see that those conditions are fulfilled upon which the simplification was based. It will then be found that the formula is of very limited application; and it should not be quoted as generally applicable. To render the section on "The Work of Others" more complete, the following list of relevant papers published during the past ten years by German workers is appended:

"Strömungsvorgänge an Gasdüsen." H. Pfotenhauer.
"J. für Gasbeleuchtung," (55), 1912, pp. 997-1002.

"Uber den Einfluss von Gasdruck und Gasdichte auf die Primärluft im Stehenden Auerbrenner." L. Ubbelohde und M. Hofsäss.
On the influence of gas pressure and gas density upon the primary aeration of the upright Auer burner.
"J. für Gasbeleuchtung," (56), 1913, pp. 149-155.

"Der Einfluss der Gasbeschaffenheit auf die Verwendung." K. Bunte.
"J. für Gasbeleuchtung," (56), 1913, pp. 173-177 and 197-201.
The influence of gas quality upon its utilization. This paper includes a discussion and certain data with respect to aeration and efficiency of different grades of gas.

"Methoden zur Beurteilung von Gasdüsen." H. Pfotenhauer.
"J. für Gasbeleuchtung," (56), 1913, pp. 486-490 and 510-514.
Methods of evaluating gas-nipples. An attempt to deal separately with the efficiency of a gas-burner as an injector and the efficiency of the gas-nipple in generating the injecting gas-stream.

"Der Einfluss der Mischrohrform und der Erärmung auf das Gasluftgemisch in Gäsglühlichtbrenner." H. Pfotenhauer.
"J. für Gasbeleuchtung," (56), 1913, pp. 1069-78, 1097-1102, 1125-1132
The influence of shape of mixing tube and of pre-heating therein upon the gas-air mixture in the incandescent gas-burner. The paper is a purely theoretical treatment of these questions.

"Erhöhung der Lichtstärke von Gasglühlicht durch Zuführung von Sauerstoff." A. Frank.
"J. für Gasbeleuchtung," (56), 1913, pp. 1286-7.
Increasing the candle power of incandescent burners by the supply of oxygen.

"Der Bunsenbrenner als Gasinjektor." H. Pfotenhauer.
"J. für Gasbeleuchtung," (57), 1914, pp. 959-62.
This appears to be a review and summary of the papers quoted in Dr. Lessing's letter.

"Uber hängendes Gasglühlicht." W. Allner.
"J. für Gasbeleuchtung," (60), 1917, pp. 460-66.
Upon inverted burners. Contains some data with regard to illuminating powers and degree of aeration.

"Uber die Strömungsverhältnisse der Zweiluft und Verbrennungsvorgänge bei Hängelichtbrennern." E. Terres und A. Knickenberg.
"J. für Gasbeleuchtung," (61), 1918, pp. 13-21, 25-33, 39-44.
Upon the relations between the degree of secondary aeration and the processes of combustion in inverted burners.

"Uber Pressgasbrenner." L. Ubbelohde und K. Zepf.
"J. für Gasbeleuchtung," (61), 1918, pp. 242, 269, 277.
High-pressure gas-burners. Contains aeration data for these burners.

"Gasbeschaffenheit und Lichteffekt." E. Terres und H. Straube.
"Das Gas- und Wasserfach," (64), 1921, pp. 309-14, 327-36, 348-54, 440-46.
Gas quality and light production. The contents of this paper have been referred to in our report.

TENTH REPORT.

Prof. COBB, as Secretary to the Research Sub-Committee, writes:

Shortly before the Belfast meeting of the Institution of Gas Engineers in June, but after advance copies of the Tenth Report of the Gas Investigation Committee had been printed, the Fuel Research Board published a report entitled "Comparisons of Some Methods of Running Water-Gas Plant."

The Fuel Research Board report deals with some of the subjects—such as efficiencies of water-gas plant, influence of varying depths of fuel, &c.—which have occupied the attention of the Gas Investigation Committee for the last three years, and have been reported upon at the annual meetings of the Institution in 1921, 1922, and 1923. There have been some differences in the methods employed, and unfortunately also in the conclusions reached. These have been the subject of very close and detailed examination by Dr. Parker. The amount of detailed calculation, &c., involved in this examination is prohibitive of publication at this stage; but its results serve, in the opinion of Prof. Smithells and myself, to justify complete confidence in the findings of the Research Sub-Committee as embodied in the Tenth Report.

Dr. A. PARKER (Research Chemist) writes:

Since the presentation of the Tenth Report of the Research Sub-Committee to the Institution of Gas Engineers in June last, an interesting article appeared in the "Gas World" of July 21, 1923, under the *nom de plume* "By an Absent Member." In this article reference was made to the fact that the thermal efficiency of the process, including the heat required to raise steam for the generator and turbo-blower, was only 37·2 p.ct. in Test B at a fuel depth of 4·25 ft., as against 41·5 p.ct. in Test A with a fuel depth of 4 ft., and 46 p.ct. in Test C with a depth of 5 ft. Apparently "Absent Member" is inclined to take it for granted that the determined thermal efficiency with a fuel depth of 4·25 ft. should lie between the values obtained with depths of 4 ft. and 5 ft.

It is believed that the actual results are satisfactorily explained in the Tenth Report, where the main points to be considered are brought out in the "Introduction and Summary of Results." In view of the article by "Absent Member," it would, however, appear advisable to emphasize further the more important points to be taken into account. At the outset, it should be stated that our first investigation of the blue water-gas process as ordinarily practised with a deep bed of fuel (*vide* Sixth Report) proved that a large proportion of the heat lost was due to the potential heat value of the carbon monoxide carried away up the stack during the blow periods. It was therefore decided to conduct an investigation with the object of determining whether the amount of carbon monoxide in the blast products could be reduced by changes in the method of operation of the plant, *without prejudice to the efficient production of water gas during the run periods.* In view of Dellwik's previous claims, tests were accordingly carried out with shallower beds of fuel.

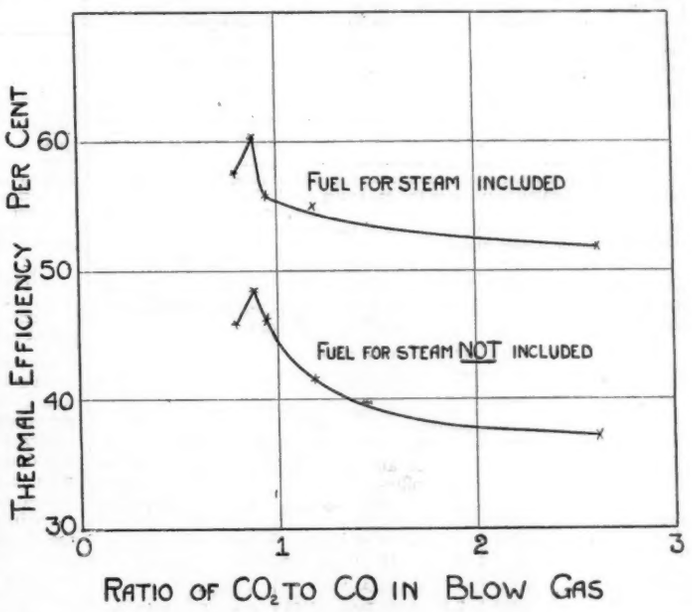
In Test A (Tenth Report), at a fuel depth of 4 ft., and with the selected cycle of operations, the blow gases still contained a large proportion of carbon monoxide—11·5 p.ct. by volume. Test B was therefore carried out at *about the same fuel depth*, actually 4·25 ft.—it is difficult to control the average depth to nearer than 3 in.—*but with a different cycle of operations* so arranged that the carbon monoxide content of the blow gas was reduced to 6·2 p.ct. From a survey of the thermal balances given in the Tenth Report, it is at once clear that, although the loss due to the potential heat of the blow gas was reduced from 18·8 p.ct. in Test A to 11·5 p.ct. in Test B, the saving of 7·3 p.ct. in the loss from this source was achieved at considerable expense in other directions. For example, of the steam supplied to the generator, the amount decomposed in Test B was 10 p.ct. less than in Test A. The final result of the changes in operation was that the over-all thermal efficiency fell from 41·5 p.ct. to 37·2 p.ct., and the yield of gas per day was reduced from 364,400 c.ft. to 307,700 c.ft. From the considerations just outlined, it is obvious that "Absent Member's" graphical representation of the results, by simply plotting thermal efficiency against fuel depth, is most misleading. The results are more correctly represented in the manner in which they are given in the Tenth Report, from which the following figures are taken

TABLE I.

Test.	A	B	C	D	Sixth Report.
Fuel depth in feet	4	4·25	5	6	7
Thermal efficiencies, p.ct.:					
Fuel for steam included .	41·5	37·2	46·0	48·6	46·3
" " *not* included	55·0	51·9	57·5	60·4	55·8
CO_2 in blow gas, p.ct. . .	13·6	16·2	11·8	12·1	12·2
CO " " " . .	11·5	6·2	15·0	13·8	12·8
Ratio CO_2/CO in blow gas .	1·18	2·62	0·79	0·88	0·95
CO_2 in water gas, p.ct. . .	4·7	8·2	5·5	4·5	4·2
Gas made per day, c.ft. . .	364,400	307,700	564,900	614,400	564,200

The proportions of carbon dioxide and carbon monoxide in the gases produced during the blow periods in the intermittent process of manufacture of water gas are largely dependent on the temperature of the fuel bed. When the temperature is comparatively low, a large amount of carbon dioxide is obtained in the blow gas, with the result that the value of the ratio CO_2/CO is high. Under such conditions, the efficiency of heat generation during the blow periods is high, but the efficiency of production of water gas during the run periods is low. With the fuel bed at a higher temperature, the value of the ratio CO_2/CO in the blow gas is smaller, with the result that a lower efficiency of heat generation during the blow periods is obtained; but the efficiency of production of water gas during the run periods is increased.

These considerations lead to the conclusion that in a graphical representation of the results of the investigation described in the Tenth Report, the thermal efficiencies are better plotted against the values of the ratio CO_2/CO in the blow gas, as in the diagram below, and not against the depths of the fuel bed. The curves



in the figure show that the maximum efficiencies were obtained in Test D, in which the value of the ratio CO_2/CO in the blow gas was 0·88—*i.e.*, the amount of carbon monoxide was a little greater than the amount of carbon dioxide. With the higher and lower values of the ratio CO_2/CO under the conditions of the other tests, lower thermal efficiencies were obtained. Curves of the type shown in the figure would have been anticipated from theoretical considerations of the chemical reactions involved.

Royal Sanitary Institute Lectures.—The Director and Secretary (Mr. E. White Wallis, F.S.S.) forwards a programme of the courses of lectures and demonstrations to be held during the spring term under the auspices of the Royal Sanitary Institute, of No. 90, Buckingham Palace Road, S.W. An introductory lecture will be given to the students in the several courses—which are for sanitary officers, meat and food inspectors, and health visitors and child welfare workers—by Dr. Charles Porter, B Sc. (Chairman of the Board of Examiners), on Monday, Jan. 28, at 5.30. Information is given in the pamphlet as to the examinations held by the Institute.

GAS CONSUMPTION IN A PRIVATE HOUSE.

[COMMUNICATED.]

The following gives an analysis of the consumption of gas in what is, practically speaking, an "all gas" house. The period covered is the whole of 1923, and the meters have been carefully read each morning throughout the year. Every care has been taken to keep the consumption down, and to prevent waste.

The house is semi-detached, and contains a large kitchen in a semi-basement, two sitting-rooms on the ground floor, three bedrooms and bathroom on the first floor, and three bedrooms and boxroom on the second floor, and the usual offices throughout the house. It is occupied by two families, the front sitting-room on the ground floor and the two large bedrooms on the first floor being let off as apartments; so that two sets of meals have always to be provided. The total number of people in the house is five during nine months and six during three months of the year.

The only coal fire in the house is the kitchen range, which is of no use except for ordinary heating purposes and to boil the kitchen and cooking water during the winter months. It has been proved that the use of the kitchen fire for the above purposes saves 200 c.ft. of gas per day during the six winter months. With this exception, the whole of the cooking, lighting, and heating is done by means of gas, and nearly every room is fitted with a gas-fire, though only those in the two sitting-rooms and one of the bedrooms are ordinarily in use. Three meters are fixed, the first recording the total consumption of gas, the second the quantity used for cooking purposes, and the third the consumption by the geyser.

Total Consumption.

Month.	Cubic Feet.	Cubic Feet. Quarter.	Therms.	Therms. Quarter.	Cost.	Cost. Quarter.
					£ s. d.	£ s. d.
January . . .	29,300		131·85		6 11 10	
February . .	15,800		71·10		3 11 1	
March . . .	22,100	67,200	99·45	302·40	4 19 6	15 2 5
April. . . .	18,800		84·60		4 4 9	
May	18,900		85·05		4 5 1	
June	7,700	45,400	34·65	204 50	1 14 8	10 4 6
July	11,300		50·85		2 10 10	
August . . .	14,700		66·15		3 6 2	
September . .	16,300	42,300	73·35	190·35	3 13 4	9 10 4
October . . .	13,550		60·98		3 1 0	
November . .	25,550		114·98		5 15 0	
December . .	29,900	69,000	134·55	310·50	6 14 6	15 10 6
Totals . .	223,900	223,900	1007·50	1007·50	£50 7 9	£50 7 9

NOTES.—The prices are worked out at 1s. per therm and 4s. 6d. per 1000 c.ft. of gas; the calorific value of the gas being 450 B.Th.U.

The drop in the consumption in February, June, and October is due to the fact that the people occupying part of the house were away for a considerable portion of each month.

As will be seen later, the estimated cost of gas for lighting is £10 per annum, and deducting this from the total leaves £40 as the cost of gas for heating, baths, water, and gas-iron, which, with coal at 45s. per ton, is the cost of 18 tons of coal.

Geyser Consumption.

Month.	Cubic Feet.	Cubic Feet. Quarter.	Therms.	Therms. Quarter.	Cost.	Cost. Quarter.
					£ s. d.	£ s. d.
January . . .	2,500		11·25		0 11 3	
February. . .	1,800		8·10		0 8 1	
March . . .	2,400	6,700	10·80	30·15	0 10 10	1 10 2
April	3,000		13·50		0 13 6	
May	2,700		12·15		0 12 2	
June	1,100	6,800	4·95	30·60	0 4 11	1 10 7
July	2,300		10·35		0 10 4	
August . . .	2,850		12·83		0 12 10	
September . .	2,350	7,500	10·60	33·75	0 10 7	1 13 9
October . . .	1,450		6·52		0 6 6	
November . .	2,000		9·00		0 9 0	
December . .	1,750	5,200	7·88	23·40	0 7 11	1 3 5
Totals . .	26,200	26,200	117·93	117·93	£5 17 11	£5 17 11

NOTE.—In addition to the bath supply, the geyser supplies the bedroom hot water in the mornings, and during the summer months in the evenings also.

The cost of heating the hot water for the baths works out at a fraction under 3d. per bath. The baths are well filled, and the water is really hot. Converted into coal at 45s. per ton, the cost of the above is equivalent to 2 tons 13 cwt. per annum.

While it is always advisable, when fixing a geyser, to have the cold water supply from an overhead tank, and so maintain a constant pressure, it is absolutely essential that this should be so in the case of a geyser fitted with an automatic valve. The geyser under observation has an automatic valve, and the cold water is from the ordinary house supply, with the result that when other taps are turned on the pressure at the geyser drops. This does not matter greatly when the valve is in perfect order; but occasionally it sticks, and when the pressure of water drops, the gas, instead of being reduced, goes out altogether. Then, when the pressure of water rises again, the flow of gas recommences "unlighted." This is what has actually happened a number of times, with the result that a serious explosion might easily have occurred.

Cooker Consumption.

Month.	Cubic Feet.	Cubic Feet. Quarter.	Therms.	Therms. Quarter.	Cost.	Cost. Quarter.
					£ s. d.	£ s. d.
January . . .	9,300		41·85		2 1 10	
February . .	5,900		26·55		1 6 7	
March . . .	6,900	22,100	31·08	99·48	1 11 1	4 19 6
April	6,800		30·60		1 10 7	
May	7,100		31·95		1 12 0	
June	2,200	16,100	9·90	72·45	0 9 11	3 12 6
July	5,950		26·78		1 6 9	
August . . .	8,250		37·12		1 17 2	
September . .	8,500	22,700	38·25	102·15	1 18 3	5 2 2
October . . .	3,500		15·75		0 15 9	
November . .	5,050		22·73		1 2 9	
December . .	6,050	14,600	27·22	65·70	1 7 3	3 5 9
Totals . .	75,500	75,500	339·75	339 75	£16 19 11	£16 19 11

NOTE.—Two gas-cookers are installed, one a large one having an oven 18 in. by 18 in. by 24 in. deep, and the other a small one similar to that usually supplied with prepayment installations. It is found that, by using the smaller oven for little things and only using the large oven when it can be reasonably filled, a considerable economy is effected.

There is no question but that the greater portion of the gas used in a gas-cooker is on the hotplate; and by constant care in this direction, considerable economy can be effected. Servants are particularly careless in this respect, and unless stopped will put-on kettles, &c., long before they are needed, and leave them on after they are required. They will also have the gas turned on much too full, and the flames flaring up the sides of the kettle or saucepan. The only way to check this is to read the meter regularly—preferably each day. The coal equivalent of the cost of cooking is 7½ tons per annum.

Consumption of Gas for Lighting, Heating, and Gas-Iron.

Month.	Cubic Feet.	Cubic Feet. Quarter.	Therms.	Therms. Quarter.	Cost.	Cost. Quarter.
					£ s. d.	£ s. d.
January . . .	17,500		78·75		3 18 9	
February. . .	8,100		36·45		1 16 6	
March . . .	12,800	38,400	57·60	172·80	2 17 7	8 12 10
April	9,000		40·50		2 0 6	
May	9,100		40·95		2 0 11	
June	4,400	22,500	19·80	101·25	0 19 10	5 1 3
July	3,050		13·72		0 13 9	
August . . .	3,600		16·20		0 16 2	
September . .	5,450	12,100	24·53	54·45	1 4 6	2 14 5
October . . .	8,600		38·70		1 18 8	
November . .	18,500		83·25		4 3 3	
December . .	22,100	49,200	99·45	221·40	4 19 6	11 1 5
Totals . .	122,200	122,200	549·90	549·90	27 9 11	27 9 11

NOTE.—The above figures are obtained by deducting the sum of the geyser and cooker consumptions from the total consumption.

One of the sitting-room gas-fires and two of the bedroom fires have rotary meters attached, and by means of these it is possible to calculate approximately the quantity of gas used for heating purposes. It is estimated that each of the sitting-room fires consumes 32,000 c.ft. of gas per annum, and the one bedroom fire in use 6000 c.ft., giving a total gas-fire consumption of 70,000 c.ft. From careful observation, it has been ascertained that the consumption by the gas-iron is 8000 c.ft. per annum.

Deducting these figures, it will be seen that the consumption for lighting purposes is 44,000 c.ft. per annum. The two sitting-rooms are each lighted by means of two Sugg full-sized burners, and the kitchen by one similar burner. There are three bijou burners in the hall, &c., and these, with the five large burners, are constantly in use during lighting hours up to midnight. The other burners are, of course, only lighted for a short time.

Thus the consumption for gas-fires, gas-iron, and lighting for the year is as follows:

GAS-FIRES.—70,000 c.ft. (315 therms), £15 15s., or equal to 7 tons of coal.

GAS-IRON.—8000 c.ft. (36 therms), £1 16s., or equal to 16 cwt. of coal.

GAS LIGHTING.—44,000 c.ft. (198 therms), £9 18s.

It is difficult to see how, under existing conditions, it is possible to reduce the consumption, having regard to reasonable efficiency.

Prize for a Scientist.—It was announced that a $1000 award was to be made to the scientist who presented the most notable contribution to the advancement of science at the seventy-fifth anniversary meeting of the American Association for the Advancement of Science, which was to be held in Cincinnati from Dec. 27 to Jan. 2. This prize was offered by an anonymous member of the Association, who was understood to be a layman living in New York, and the recipient was to be selected by a Special Committee. All the 1200 to 1400 speakers at the meetings of the 42 sections and societies to meet with the American Association were to be eligible for the prize.

THE RANELAGH METER WORKS.

Visit of the London and Southern District Junior Gas Association to Messrs. George Glover & Co., Ltd., Chelsea.

The fourth of the official visits—made, be it noted, at lessening periods of years—of members of the Association to the Ranelagh Works, in King's Road, Chelsea, of Messrs. George Glover & Co., took place last Wednesday afternoon, when the attendance indicated keen appreciation of this further opportunity of making close acquaintance with the operations of a firm whose name has been so long, and deservedly, popular throughout the gas industry. The business is very old, it is true, but it is still growing; and since the date of the last previous visit considerable extensions have been carried out. As these were the subject of an illustrated article in the "JOURNAL" as recently as Oct. 3 last (p. 51), it is unnecessary now to deal in detail with the works. Suffice it to say that the members were able to see meters and their parts in all stages of manufacture under excellent working conditions, in shops which are designed and fitted to cope with a very large output of well-made gas-measuring appliances. In the "Home of the Ranelagh Meter" everything is thorough. The members saw this in the material used, in the workmanship, and in the hospitable welcome accorded them.

On arrival, they assembled in the new canteen, where they were met by Mr. H. M. Thornton (the Managing-Director of Messrs. George Glover & Co. and the Richmond Gas Stove and Meter Company), Mr. J. William Glover (late Managing-Director of Messrs. Glover & Co.), Mr. Albert W. Glover (General Manager), Mr. Frank Richmond, and Mr. J. W. Slack (of the Richmond Company).

Mr. THORNTON said that, on behalf of Messrs. George Glover & Co., he had great pleasure in offering the Association a hearty welcome. He understood that this was the fourth occasion on which they had visited the works, and they would find that considerable alterations and improvements had been made since they were last there. They hoped this would be by no means the last visit. The business had been established for a great number of years; and Mr. William Glover (who had been associated with it for a very long period, but who retired some years ago from active participation in the business) had come to say a few words to them in connecion with this subject. He would ask him to address the gathering; and after that Mr. Albert Glover would outline the afternoon's programme.

HISTORY OF THE GLOVER METER.

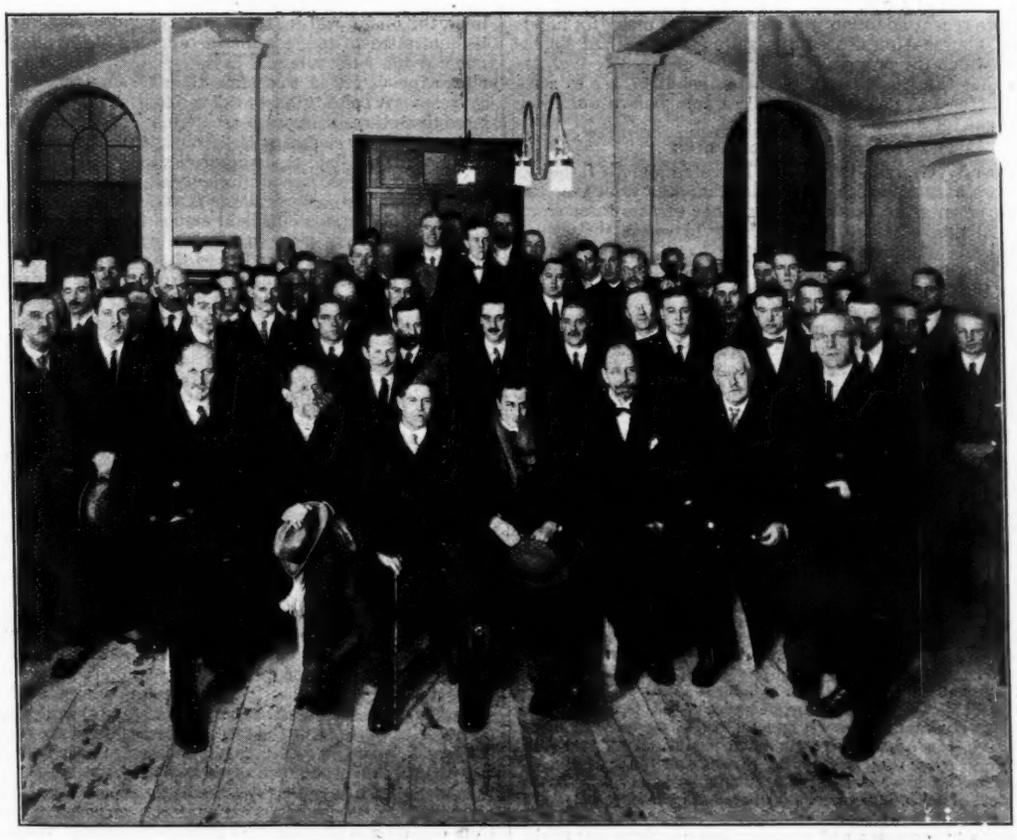
Mr. J. WILLIAM GLOVER said it was a great pleasure to him to meet them in the home of the "Ranelagh" meter, though, as he retired in 1916, he was really now a visitor, like themselves. He hoped they each possessed a copy of the booklet entitled "The Home of the Ranelagh Meter," which gave some account of the firm, and which they could read at their leisure, if they had not already done so in the "GAS JOURNAL." He need therefore only supplement the information there given very briefly.

The Glover meter was patented in 1844 by William Richards. The shape of the meter was soon altered from the original "fiddle" shape to the present rectangular shape, which facilitated the manufacture, and at the same time gave more room in the upper part for the adjustment and regulation of the valves. In 1854 his father, Dr. William Glover, of Edinburgh, died, and in a few weeks he (the speaker) was duly installed as junior with his uncle Thomas, in Suffolk Street, Clerkenwell—office hours 6 a.m. to 6 p.m. One of his earliest recollections was that of the meter with only one leather diaphragm, without metal disc. This had a by-pass to keep the lights from going down as the one diaphragm changed directions in its motion to and fro. This by-pass, of course, proved unsatisfactory. Then there was the horizontal beam action dry meter, with four diaphragms; while other dry meters had two and three diaphragms, such as Shears and Defries, both with cylindrical cases, and very generally with rotary valves. Each of the diaphragms of the Defries meter had four triangular plates to protect the leather, while the Boulton dry meter had a square or oblong metal disc opening like a door, with the leather as a hinge. Now all the makers (wet and dry) were manufacturing the Glover dry meter, which thus showed itself to be the "survival of the fittest."

In 1861, on completion of his work for the Government, in connection with the Standard Test Gasholders, Dr. George Glover set himself the task of introducing the same personal supervision and meticulous attention to detail in the design and manufacture of dry meters which he had so successfully applied to the standard instruments. He (the speaker) had been acting as private secretary to his uncle Thomas, and at the period referred to undertook the same duty for his uncle Dr. George Glover.

In the proving room they would see the copy of the 5 ft. standard test holder. They would notice that the bell of the instrument was made of an alloy of tin and antimony, similar to that used in the valves and gratings of the firm's meter. They would observe that the bell was, after 63 years, quite free from any sign of corrosion. The only difference between this instrument and those at the Standards Department was that a steel band was used, instead of the expensive "chain," for carrying the counterpoise weight of the bell.

Many experts would tell them that a large dry meter did not measure small quantities of gas, but this did not apply to the firm's meter; and they would see in the proving room that there was a 150-light meter registering the gas for two small burners, practically the 100th part of its badged capacity. Messrs. George Glover & Co. had exhibited similar meters at exhibitions for many years, and he had been told that these were new meters, and that if tested after use the result would be very different. But some years ago, when the Gas Light and Coke Company were testing



THE LONDON JUNIORS AT THE RANELAGH WORKS.

their meters periodically, he had the unique opportunity of getting the results of the tests of three 500-light meters which had been in use for eight years; and he had in his hand the original letter written by the Chief Meter Prover of that Company, showing that these meters were registering correctly, and each registering with a small light 3 c.ft. per hour (a 1000th part of their badged capacity).

In 1888, the firm had a visit—such as the Association were now paying—from Sir George Livesey; and after testing the meters of various makers, at their works and at Old Kent Road, they received the following letter:

As you are aware, this Company for many years never purchased a dry meter, on the ground that the registration could not be depended upon, particularly under varying pressures and amount of consumption. We have now, as you also know, relaxed the rule, and supply dry meters to those consumers who require them, because we have found that your meters are so constructed that they are practically correct whatever may be the pressure or rate of consumption.

Since the advent of the coin meter, he supposed the South Metropolitan Gas Company had used nothing but dry meters; and their firm had the distinction of making all the automatic movements used by that Company.

In 1898 Dr. George Glover died, at the age of 95, and in 1900 the firm was turned into a private limited company, with his cousin, Mr. George Raleigh Glover, as Chairman; and on the retirement of Mr. Thomson Glover, his (the speaker's) son, Mr. Albert Glover, became Works Manager. In the following year, on the death of Mr. George Raleigh Glover, he (Mr. William Glover) acted as Managing Director for fourteen years, until 1916, when he retired, and Mr. Albert Glover took his place as General Manager (after an experience with the firm extending over 28 years). Thus the continuity of the personal oversight of the manufacture inaugurated by Dr. George Glover had been continued to the present day.

In the diaphragm department, the members would notice the care taken in selecting and preparing leather diaphragms. The strips of leather were sewn with a double seam, with white silk; and while every stitch secured the leather, the needle had not once gone through the skin. Each section was afterwards examined in a dark room, so that if the leather had been pierced by the needle, even in one place, the seam might be cut out and replaced. They had to train their own sewers for the work—a glove sewer put the needle through every time. This did not refer to the new standard meters, the principal sizes of which were made without any seams in the diaphragms.

PREPAYMENT METERS.

Since his retirement, the firm had brought out the "Ranelagh" price-changer prepayment meter, in which the coin was inserted, and the thumbpiece discharging it was situated, in the front; and the very simple price-changing disc was also in front of the meter. The range was from 5 c.ft. to 47 c.ft. per penny, and from 60 c ft. to 564 c.ft. in the shilling meter. There were no change wheels. The valve opened at 5 c.ft.

A still more recent adaption was a prepayment meter for hotels or boarding houses—for use with gas-fires. These had an ingenious key which the proprietor used after each guest had departed, so that the prepayment indicator might be set to zero. A new visitor had to put in the required coin before obtaining a supply of gas for his fire.

THE SUBSEQUENT PROCEEDINGS.

Mr. ALBERT W. GLOVER joined Mr. Thornton and his father in welcoming the Association, and remarked that they would see the great improvements the firm had been able to carry out since they acquired the freehold. The building in which they were then assembled was once a Wesleyan Chapel, and later the Salvation Army had possession. Now it had been adapted as a canteen for the firm's employees, and that afternoon's meeting really formed the opening ceremony.

The tour of the works was made under the able guidance of Mr. Albert Glover, Mr. Bingham (Works Manager), Mr. A. E. Flood (Office Manager), Mr. J. P. Pratt (London Representative), and others. Subsequently there was a return to the canteen for tea, after which,

Mr. W. L. WESTBROOK (North Middlesex Gas Company), in the absence of the President, Mr. W. Grogono, who was unfortunately laid up with influenza, expressed the gratification of those present at their reception, and at the fact that Mr. William Glover, though 82 years of age, had come along in such inclement weather to address them. They were also deeply grateful to Mr. Thornton, Mr. Slack, Mr. Richmond, and the various representatives of the Richmond branch who had been present to meet them, as well as to Mr. Albert Glover and the members of his staff who had assisted in showing them round. It was impossible to think of a meter without at the same time thinking of the name of "Glover."

On the proposition of Mr. W. T. KENSHOLE (Lea Bridge District Gas Company), seconded by Mr. F. E. WOODFINE (South Suburban Gas Company), a hearty vote of thanks was passed to the firm and to all the gentlemen above referred to for making the visit so interesting and for the hospitality extended to the members.

Mr. ALBERT GLOVER, in acknowledgment, said it was a very great pleasure to have the Association with them again. Their previous visits had been in 1907, 1914, and 1920. Now it was 1924, so that as time passed the visits were recurring at shorter intervals. There was a great deal of work and supervision entailed in the manufacture of meters, and the firm were always only too pleased to show their friends the different processes, and to answer any questions that might be put to them.

Mr FRANK RICHMOND remarked that Mr. William Glover was an excellent example of the healthy life that gas must be for them all. The firm hoped it would not be long before the Association once more visited the works.

Mr. SLACK also expressed the pleasure it was to them all to see the members. He himself had had fifty years service in the gas industry, and he hoped every one of those present would live to attain a like record.

Mr. WILLIAM GLOVER, on being called upon, gave his hearers some excellent advice. He said he did not think it was a disadvantage to a young man to have to work hard, but at the same time he warned them all against working seven days a week. This was one thing he had never done in his life.

THE "ARCA" AUTOMATIC REGULATOR.

[Extracts from a Paper by Mr. T. Lindsay.]

At a meeting of the Institution of Heating and Ventilating Engineers, held at the Engineers' Club last week, Mr. T. Lindsay read a paper entitled "A new Universal Regulator for the Control of Temperature, Pressure, Humidity, &c." Part of the lecture had special bearing on the use of the "Arca" regulator for the control of gas pressures; and we have been privileged to publish extracts from the paper, which, it is hoped, will prove of interest to our readers.

The value of automatic regulation, either for the purpose of obtaining uniform working, and thereby uniform production both in quality and quantity, or to effect a saving in fuel, is too well known to require emphasis. Automatic regulators, said Mr. Lindsay, should be quick in action—that is, free from lag—sensitive to small changes in conditions, simple in design—so that the average works engineer can readily understand the principle—of robust construction calculated to withstand the wear and tear to which apparatus is liable to be subjected in factories, and, finally, besides having an unlimited operating power for controlling any size of valve, the regulator should be flexible, so that its application to different problems does not call for special construction. The foregoing is a most stringent specification; but the lecturer sought to prove that these requirements were embodied in the "Arca" apparatus.

It is neither desirable nor practicable that we should enter into a detailed description of this ingenious regulator, for a broad survey of its applications to gas control are of more import to those in the gas industry than would be a description of the governing mechanism; suffice it, therefore, to indicate briefly the main principle underlying its working. The apparatus comprises a single-acting water-pressure cylinder and a counterweight; water power being the operating medium. The pressure necessary to operate may range from 10 to 80 lbs. per sq. in., and such pressure is readily obtained from any public water main. A pilot valve attached to a servo-motor controls the inlet and outlet of water to the cylinder. If the valve be opened to inlet, the piston will recede into the cylinder, causing the valve to be controlled to open; while the opening of the pilot valve to exhaust reduces the pressure in the cylinder, and the counterweight closes the valve, at the same time forcing the water from the cylinder. A connection is taken from that which is to be regulated to a relay, or impulse receiver. The latter is the only part of the regulator requiring to be changed according to the physical property of the fluid to be controlled.

Where gas pressures are to be dealt with—say, from one-tenth water-column upwards—a large-area diaphragm is used as impulse receiver. This is made as light as possible, so that small increases in pressure are sufficient to accelerate it. This type of regulator has been successfully applied to the control of gas pressures in producer plant. The make in producers is entirely governed by the blast; and it is common practice to control each producer by hand regulation. When automatically controlled, however, all valves are set more or less fully open, so that the pressure obtained at each producer is the same at any particular moment. An impulse is taken on the gas-main to the gas-pressure relay; a water-pressure cylinder and counterweight controlling thereby the steam to the battery of producers. Owing to the fact that the movement of the diaphragm is minute, there is practically no admission of gas into the pipe connecting to the relay; and, providing this is kept gas-tight, no trouble is experienced from tar or other impurities becoming attached to the diaphragm. The author cited an example of the saving effected by automatic control. He said that, in one particular case, a steelworks engineer estimated a saving of 15 p.ct. on a total fuel consumption of 700 tons per week—in other words, a net reduction of 105 tons per week.

For coke-oven plants, where it is desirable to maintain a pressure on the ovens as near as possible to that of the atmosphere, the regulating valve would be a simple type of butterfly valve controlled by means of the cylinder and counterweight; the impulse being taken to the relay from the coke-oven side of the valve. Experience has shown that, after four years' working, tar, dust, or other impurities in the gas in no way affect the regulator. A coke-oven plant is continuously operating; it is therefore necessary that provision be made whereby the water supply is not interfered with. It is generally found advisable to instal a filtering arrangement in duplicate, so that the service can be obtained from one filter while the other is being cleaned. What applies to coke-ovens applies equally well to gas-works practice. For the

control of gas vacuum, the lever is arranged on the front side of the panel, so that a tendency to increase in vacuum has the same effect as a tendency to increase in pressure would have in the case of a pressure panel.

The regulator has also been successfully applied to the control of gas vacua in the case of turbo-driven exhausters. Due to the high kinetic energy of the revolving masses comprising the exhauster and turbine, it is impossible closely to regulate vacua by governing the steam to the turbine, for a considerable time elapses before a drop or an increase occurs in the speed. When it is required to maintain a constant drop between two points, or, in other words, a constant volume passing a given point, a sluice valve is used for the purpose of forming a Venturi meter; an impulse being taken from each side of the valve. The impulses are connected to separate diaphragms arranged so that the pressure or vacuum on one acts against that on the other. A spring on the jet lever takes up the difference in the load, so that any change immediately affects the relay and the pilot valve; the cylinder and counterweight coming into action to correct this difference by operating a butterfly valve. By arranging a spring to balance the weight of the lever and part of the load on the lever due to the spring, it is possible to use such a relay for maintaining equal pressures on two sets of gas producing plant having a common exhauster. Whichever had the higher pressure would cause the regulator to operate the valve, thus effecting a balance.

The supply water to water-cooled condensers should be controlled so as to keep the temperature of the gas leaving the condensers as nearly uniform as possible. This is another instance of the application of the "Arca." As the relay has to withstand the action of ammonia, &c., a tube of monel metal is employed.

These few notes only indicate the applications of the regulator to processes in which gas engineers are interested; but, in the paper, Mr. Lindsay mentions many other applications for which the "Arca" is most suitable—such as the control of high and low pressure steam and liquids, of humidity and temperature in air-conditioning plants, of steam pressure in back-pressure or pass-out engines, of load on electric motors, of temperature in calorifiers and drying tunnels, and the automatic regulation of levels in tanks or vessels under pressure or vacuum. Judging by the examples given, the applications must be almost unlimited.

A STUDY OF SOME PHYSICAL LAWS GOVERNING THE CARBONIZATION OF COAL.

By A. W. WARNER, of the Philadelphia Suburban Company, Chester (Pa.).

[A Section of the Report of the Committee on Carbonization and Complete Gasification of Coal submitted at the 1923 Convention of the American Gas Association.]

(*Continued from p.* 91.)

It is evident that each time a condensable hydrocarbon of a given vaporization point is cracked, there ensue three physical products—a light oil, a heavier residue, and free carbon. The heavier residue, upon further accession of heat, in turn splits up into a lighter oil, a still heavier residue, and more free carbon. With each accession of heat causing cracking, more and more must become the heat necessary to drive off the final volatile. In such tests, as we can be sure all the condensable hydrocarbons are educted away from the heat, a low-temperature incidence drives off practically all the volatile matter from the coal residue right up to the edge of the plastic mass of the carbonizing coal. However, if the pressure conditions be such as to force these vapours out through the heat, the time required for carbonization becomes much greater, as well as the amount of residual volatile.

A physical separation of the condensable from the non-condensable hydrocarbons, it would appear, is even superior to a vacuum method of distillation, because in a vacuum distillation the conditions in the mass vary according to the coal sizes. Cracking the primary oils not only wantonly breaks down valuable oils into 4 p.ct. of gas *plus* degraded tar and free carbon, but also calls for an enormous and useless expenditure of carboniz ing heat to obtain any rapidity of throughput at all. Perhaps the following crude test will more clearly bring out this point. A sample of tar—79 p.ct. oil and 21 p.ct. oil coke—was distilled in a copper still with the ring burner set above the level of the oil, but too low to carry the vapour fast enough to the condenser. This cracking test demonstrated that some 33 p.ct. of the oil could be distilled over before reaching the temperature of the first drop in the original distillation. However, it was found that only an additional 17 p.ct. of oil could be distilled before oil coke was reached.

In a carbonizing chamber such as was used in these tests, it is evident that we have indicated one way to carbonize a relatively high amount of coal per square foot of retort surface with comparatively low temperatures at the retort walls, and to protect the primary oils to a degree at least approaching the oils of low-temperature vacuum carbonization. We pass heat from a con stant source of supply through the charge progressively, and withdraw the gases and vapours by two paths—one protected from the heat, and one exposed to the heat. Therefore we carry on simultaneously two diametrically opposite gas-making processes. Such inwardly flowing gases and vapours as are condensable condense, and repeatedly come into contact with oils and vapours condensed at lower temperatures. As the inwardly travelling heat progresses, the gases undergo an oil-scrubbing treatment. In this way, at least, all the oils and vapours formed up to 750° (and these include practically all of the condensable hydrocarbons) escape, driving ahead of them all the water vapour.

The coal at the same time receives an acid washing similar to that already described. The outwardly flowing gases, freed from these more unstable, high-vaporization, residue-leaving constituents, are formed under more ideal gas-forming conditions. These gases and vapours mix with gases of a higher hydrogen content, and can be made to pass through the range of rising temperatures most suited to the ultimate formation of stable gas, high in ethane, methane, and illuminants.

It has been generally accepted as a fact that the ability of coal to absorb heat is greater than the means of bringing heat to the coal, because the heat must fuse or vaporize one particle of coal before it can pass on to the next. We find during the progress of carbonization 900° (2 p.ct. vol.) coke and 200° coal separated by a plastic film $\frac{3}{32}$ in. thick. This type of carbonizing chamber increases this ability to absorb heat to a maximum, by avoiding the needless cracking of condensable hydrocarbons remaining between the source of heat and the film.

The heat penetrating the retort walls, and used in high temperature carbonization, is usually proportioned about as follows:

	P.Ct.
Decomposition and distillation	37½
Heating gas and vapours	26½
Sensible heat of the coke	36

All gases and oils passing within this film are never re-heated above their vaporization point or broken up. The film avoids the necessity of a fixing chamber, and becomes, as it were, a scrubber and a condenser for these gases. All the hot vapours passing from this 750°-200° film must condense and re-condense coke-forming constituents. The larger the gas flow in this direction, the better must be the coke formation. As all the water has been driven inwardly ahead of the oils, and the frothing constituent has been washed out by the acids, the coke-forming residue must be quiescent and free from frothing.

With this method, there can be no fear of swelling coals. Nor has mass under these conditions much to do with the coke formation. All gases and vapours passing inwardly must have been heated above 660°, and, therefore, must have given up a major portion of their heat in passing inwardly, helping the film in its inward travel. The fuel required for heating the gases and vapours should be cut away below that required for other high-temperature processes. In fact, most of the water in the coal escapes as vapour, and not as steam. With this method of egress, the oven heat must form the film before raising the temperature of the water vapour, so preventing too slow volatilization of coke-forming constituents, and giving a maximum duration of heat for graphiting the coke.

Thus we see that this form of test apparatus can avoid, to the utmost, cracking of the oils, and give us a clear idea of the relative intensity of heat required for carbonization with and without cracking. It makes possible the simultaneous production from coking coal of a full yield of gas, a full yield of low-temperature tars, and a low-volatile close-grained coke.

4.—*The less the heat through which the gases from the non-condensable hydrocarbons must pass in leaving the retort, the richer will be the gases and the greater will be the B.Th.U. feet per unit of coal.*

So much has been written on the subject of the influence of heat on hydrocarbons, and so conflicting have been some of the deductions, that it is not necessary, at this time, to review this subject. However, it is essential to bear in mind that, in ordinary methods of high-temperature carbonization, there seems to be a critical temperature between 1300° and 1500°, and the rate of gas evolution and the quantity per pound are nearly double at 1500° what they were at 1300°. Above this critical range of temperature, the evolution of hydrogen rapidly increases. The evolution of hydrocarbons of the paraffin series practically ceases at 1300°. Methane is very stable up to 1500°. The carbonization problem, therefore, has been one of keeping the hydrogen content of the gas as low as possible consistent with driving off the volatile matter, because it has been felt that high hydrogen indicates uneconomic cracking of high B.Th.U. gas constituents.

The following table (Jones and Wheeler) clearly shows the influence of heat on low-temperature tars.

Low-Temperature Tars.

Temp. ° Fahr.	Higher Olefines	C_2H_2.	C_2H_6.	CH_4.	H_2.
1020	21·7	0·7	18·2	19·6	29·4
1110	12·5	1·3	11·3	33·9	33·6
1200	11·4	0·9	12·0	39·0	27·4
1290	8·2	1·3	2·4	43·8	36·2
1380	0·7	1·2	1·2	56·1	33·2
1470	1·0	1·3	—	33·0	60·7

Prof. Lewes shows the influence of heat on the final gas about as follows:

A ton of coal yielding 4000 c.ft. of gas under ordinary low-tem-

perature (1100°) carbonization yields 10,000 c.ft. of gas in high-temperature (1800°) horizontal retorts. The residue after low-temperature carbonization, heated to 1800°, yields 4500 c.ft. of gas. We may assume the 10,000 c.ft. of gas to have been made up as follows:

—	Cubic Feet.	Per Cent.
Primary gas	4000	40
Degradation (11 p.ct.)	440	4·4
Residue in coke	4500	45·0
Gasified tar	1060	10·6

Our experiments have shown us that it is economical to drive off the volatile from coal at a temperature of 1470° and even lower, and that the condensable tars (oils) can at the same time be driven off at a temperature of 750° Fahr. and lower. Therefore, referring to the above example, it must be possible to obtain the full gas yield from the non-condensable hydrocarbons with far less degradation of the primary gas. There should be no gasified tar, but in its place oil removed at low temperature for more suitable economic uses. An ethane content of 8 p.ct. is not unusual for gases evolved in these tests with a retort wall temperature of as high as 1470°. Such gas contains absolutely no trace of naphthalene.

As the complete range of carbonization from rich low-temperature gas to lean gas from the residual volatile is continuously taking place within the narrow range of the plastic film, there is practically no change in the B.Th.U. content of the gas from start to finish of the charge. Once these heat reactions (1020°-1470°) on low-temperature tars are obviated, and degradation of the primary gases is brought to a minimum, the study of gas from the coke residue becomes simplified. The presence of high vaporization point relics of the condensable hydrocarbons in the coking residue from high-temperature carbonization so changes the retort atmosphere in the mass as to require high temperature to drive off the remaining volatile. So far as driving off the non-condensable hydrocarbons goes, no such temperature as 1300°-1500° is necessary. The ultimate products of the multitude of constituents in coal are materially influenced by factors other than the distillation temperature. We must know the atmosphere, pressure, and temperature at the moment of formation. As cracking invariably means a loss in gaseous B.Th.U., it becomes evident that this process must give the maximum B.Th.U. feet of gas from the non-condensable hydrocarbons.

5.—*The less the heat through which the gases from the non-condensable hydrocarbons must pass in leaving the retort, the greater will be the possible c.ft. of mixed gas of a determined B.Th.U. per unit of coal.*

This proposition is largely a problem in arithmetic. Owing to the removal in gaseous form of practically all the volatile residual in the coke, the gas in our tests averages some 700 B.Th.U., whereas low-temperature gas should average 1000 B.Th.U. In the one case we have 4000 c.ft. at 1000 B.Th.U. *plus* 4000 c.ft. of 400 B.Th.U. In the other case we have 4000 c.ft. of 1000 B.Th.U. gas and the remainder in the coke residue. Inasmuch as 300 B.Th.U. blue gas represents the richest gas that can be made as a dilutant from coke, this 4000 c.ft. of 400 B.Th.U. gas must represent a distinct gain. It can be shown this way:

4000 c.ft. at 1000 + 10,000 c.ft. at 300 = 14,000 at 500 B.Th.U.
8000 c.ft. at 700 + 8000 c.ft. at 300 = 16,000 at 500 B.Th.U.

Every time a high B.Th.U. gas is broken down into two volumes of low B.Th.U. gas and free carbon, the less 300 B.Th.U. blue gas can be used to obtain a determined B.Th.U. This same reasoning applies to producer gas or any other substitute or combination.

Conclusions.

A tremendous amount of work has been expended in the past by our fraternity, we feel, in trying to get rid of the labour connected with the products of degradation of hydrocarbons. Its work has been too largely with secondary problems; and the fact that degradation and its cost in raw materials have taken place, has not caused enough concern. Had the presence of these troublesome products not caused labour costs to appear on the balance-sheet, much less study along these lines would have ensued. One has only to stop to review the direction of the study given to stoppages from naphthalene and degraded tar, to realize that much of this study could profitably have been put on the primary consideration of avoiding their formation.

In sketchily treating this angle of the physical aspects of coal carbonization, no attempt has been made to record any close measurements, nor to balance the component parts with the original coal. Rather have we tried to put in some semblance of logical form certain laws, the understanding of which in their relationship to each other might be useful in determining how gas coal should be retorted to produce the most economical total of saleable constituents.

Gas Oil.—The "Petroleum Times" announces that the official price of gas oil is now 5d. per gallon, net and naked, *ex* wharf. This is an increase of ½d.

A CHEMIST ON WORKS PRACTICE.

By ROBERT STURROCK, of Glasgow.

[Extracted from a Paper read before the Scottish Junior Gas Association (Western District) on Jan 12, 1924.]

The co-operation of the engineer and the chemist has been in vogue throughout the gas industry during the past few years; and every day that passes seems to bring home to all who have its interests at heart the fact that it and they are reaping the fruits of this union. The chemist is now recognized as being essential in all up-to-date works, large or small, though his scope for research work is confined principally to the larger ones. The chemist has undoubtedly proved his worth to the industry.

Carbonizing Plant.

The carbonizing plant at the Dalmarnock Works of the Glasgow Corporation consists of three sections of Wilson's "Glasgow" continuous-intermittent vertical retorts, each section comprising two benches, and each bench containing four ovens of ten retorts per oven. One producer is common to each oven. Each bench (*i.e.*, 40 retorts) is capable of carbonizing in 24 hours 3 tons of coal per retort, or 120 tons per day, equal to 1,250,000 c.ft. of 500 B.Th.U. gas working on 4-hour charges. The retorts are rectangular in shape, 21 ft. 3 in. long by 3 ft. 4 in. by 10 in. at the top and 4 ft. by 1 ft. 6 in. at the bottom, tapered from the top for 8 ft. 9 in., and then parallel for 12 ft. 6 in. to the bottom. Actual practice has shown that the best results are obtained with 5-hour charges. Approximately 10 cwt. of coal are charged at each operation, and 6 cwt. of coke withdrawn.

Heating of Retort Settings.—The Producers.

The heating of the retorts, and the control of temperatures in the setting are duties which should rest with the chemist. The producers are rectangular in shape; the dimensions being 4 ft. 5 in. by 3 ft. 3 in., the height from bars 32 ft., and the grate area 30 sq. ft. They are clinkered every 48 hours; about 20 p.ct. of the coke produced being used in the producers. The average composition of the producer gas is 3 to 4 p.ct. of CO_2 and 26 to 27 p.ct. of CO. When the percentage of CO_2 becomes abnormally high, an examination of the fire sometimes reveals the fact that an excess of steam is being admitted. It is common practice for producer firemen to allow an excess of steam into the producer in an attempt to curtail the formation of clinker. To avoid this, reducing valves have been installed in the pipe lines to each set. A working pressure between 1/100 in. and level gauge in the producers gives the best results.

The waste gases leaving the setting contain from 17 to 18 p.ct. of CO_2, and from 0·6 to 1·6 p.ct. of O_2; the pull at this point being maintained at 18 to 20 hundredths.

Recovery of Coke from Pan Ash.

A series of seven tests was carried out; the method employed being as follows: After collecting the contents of the ashpit, and quartering in the usual manner, the ash was hand riddled, and each portion washed in a bath of clean water while held on an ⅛-in. mesh riddle, the small material being allowed to settle. The coke and clinker in each instance were separated by hand; the water was then carefully drained off, and the fine ash collected, with the following result:

	P.Ct.
Coke	= 15·7
Clinker	= 43·0
Fine ash	= 41·3

Analysis of coke used in producer—

	P.Ct.
Volatile matter	4·8
Fixed carbon	83·3
Ash	11·9
	100·0 (moisture, 14·78 p.ct.)

Analysis of coke after use, and recovered from pan ash.

	P.Ct.
Volatile matter	1·4
Fixed carbon	81·6
Ash	17 0
	100 0 (moisture, 2·0 p.ct.)

One would naturally conclude from the percentage of coke in the pan ash treated that it was worth recovering; but consideration must be given to the method used—namely, hand washing and picking. In view of the very small quantity of coke which floated in each sample, combined with the low volatile matter, the utility of this coke is questionable, unless used where full advantage could be taken of the carbon content.

Coal Testing.

The usual practice in the larger works is to have a coal-testing plant capable of dealing with specified samples of the various coals received. We are at present completing the erection of a gasholder and tank in connection with our test plant, which has been recently erected at Dalmarnock. When completed, this plant will be capable of dealing with 2 to 3 tons of coal per day. It consists of a complete bed of six horizontal retorts, with exhauster, condenser, washer, scrubber, and purifiers, and is fitted with small test or mixing holders into which samples of gas can be drawn during the test. Calibrated tanks for collecting the tar and liquor produced are also provided. In the absence of the

plant, the method adopted for comparing the values of different coals consisted of submitting each to a proximate analysis, and comparing the results against the following standard table:

Coals containing 35 to 40 p.ct. volatile matter, 3 to 9 p.ct. ash, 1st class.
" " 30 " 35 " " " 9 " 15 " " 2nd "
" " 25 " 30 " " " 15 " 20 " " 3rd "

We were thus in a position to know which coals would best serve our needs. For example, when a high percentage of 3rd class coals were going through the retorts, it was found that the quality and make of gas were affected; also the clinkering troubles in the producers were more acute.

STEAMING.

Recently we carried out a four days' test; the object being to determine what would be the most suitable pressure of steam to admit to the retorts, taking into consideration the likely effect on the quality and quantity of gas produced and on the bye-products. The test was run from 8 a.m. to 8 p.m. each day; and every two hours the pressure of the steam entering the retort was altered. At the end of the two hours' run the analysis of the gas was taken, and the production of tar and liquor determined. The efficiencies of the washing and scrubbing plant were tested, and also the temperatures of the retort setting and other parts of the bench.

The diameter of the steam nozzles used varied from $\frac{1}{4}$ in. at the point nearest to the steam inlet pipe to $\frac{3}{8}$ in. at the farthest point.

Steam Pressure. Lbs. per Sq. In.	Gas Made in C.Ft. Corrected.	C.Ft. of Gas per Ton of Coal.	Inerts in Gas.			Calorific Value. B.Th.U. per C.Ft.	Therms per Ton.
			CO_2 P.Ct.	O_2 P.Ct.	N_2 P.Ct.		
40	231,600	13,885	10·2	0·3	5·77	495	68·7
30	228,700	13,712	9·0	0·4	6·19	498	62·3
20	212,200	12,722	8·4	0·5	10·02	473	60·2
20	203,500	12,200	8·0	0·4	8·49	492	60·0
30	219,000	13,130	9·3	0·3	7·05	485	63·7
40	224,000	13,430	9·6	0·4	6·77	487	65·4

It will be seen from this table that when the pressure of steam entering the retort is reduced the make of gas falls away, the CO_2 content in the gas decreases, and the N_2 increases; the production of therms also decreases. Regarding the productions of tar and liquor, it proved difficult in such a short time to determine with any degree of accuracy what these were; but, from the data obtained, it appeared that the tar increased, while the liquor and the percentage of NH_3 present in it decreased. When the pressure of steam was again increased, the make of gas came up very slowly (much slower than the ratio of fall when the steam was reduced), the CO_2 content in the gas increased, the N_2 decreased, and the production of therms increased. The tar produced became less, and the quantity and strength of the liquor increased. Judging from these results it would appear that as the steaming is increased a reaction takes place in the retort involving the C, H_2, and N_2. Free ammonia is formed; and, from the results of the analysis of the gas, it is observed that the CH_4 is reduced. Increased steaming has proved in this case to result in an increased yield of therms and ammonia, with a reduction in the N_2 content of the gas. The average temperature at the top of the setting was 1820° Fahr., and at the bottom 1664° Fahr. The efficiency of the washing and scrubbing plant was maintained throughout the test at 95 p.ct.

WASHERS AND SCRUBBERS.

Two Livesey washers, each capable of dealing with 3,000,000 c.ft. of gas per day, two tower scrubbers, one St. Mungo scrubber-washer, and one acid washer of the same capacity are employed for the removal of ammonia, &c., from the crude gas. The gas leaving the exhausters passes through the Livesey washers, thence to the tower scrubber or St. Mungo scrubber-washers, and then to the acid washer. On an average, the NH_3 per 100 c.ft. of gas at the inlet to the Livesey washer is 284 gr., at the inlet of the acid washer, 3 gr.; the average efficiency of this plant is 99 p.ct. The practice adopted for working up the gas liquor is by circulating the weak liquor from the storage well to an overhead tank in the retort-house. From this tank it flows by gravity through the hydraulic main to separators, where any tar in suspension is eliminated. Leaving the separators the liquor runs to a cooler, in which it becomes cooled from a temperature of 120° to 130° Fahr. to 70° to 75° Fahr. This cooler is situated outside the retort-house, and consists of a series of pipes constructed inside an overhead tank which supplies water to the hydraulic pumps. When it leaves the cooler at this temperature, the liquor runs straight to the scrubber well, is pumped through what is called the "clean" scrubber (*i.e.*, the last scrubber in series through which the gas passes), and is collected in the well of the dirty scrubber. In turn, it is forced through this scrubber and collected in a well situated at the bottom, from which it is pumped to the Livesey washers. Leaving the washers, it runs by gravity to the chemical works storage tanks.

Details of the strength of the liquor at each point in the process are:

—	°Tw.	P.Ct. NH_3.	Oz. Str.
In the storage well	3·0	0·77	3·55
Outlet of clean scrubber	4·0	0·99	4·15
" " dirty scrubber	4·8	1·19	5·49
" " Livesey washer	6·2	1·96	9·04

THE ST. MUNGO SCRUBBER-WASHER.

This scrubber-washer is the invention of the Works Manager, Mr. John Frazer, with whose kind permission I am enabled to submit to you details of its construction, and also the results of tests which I have carried out on it. It comprises a tower, the cylindrical wall of which is fitted with a series of spraying devices, and the base of which constitutes a receiver for ammoniacal liquor. Spanning the base is a skeleton structure in which is mounted a series of coaxial hollow perforated conical elements, with which are associated a series of imperforate hollow frusto-conical elements, which latter receive the spray from the spraying devices and direct the liquid in the form of a series of cascades towards the receiver. Interposed between the frusto-conical elements and the receiver is an imperforate plate so dimensioned as to provide an annular opening for the passage of gas from the receiver end of the tower towards the upper end. Depending from the peripheral edge of the plate is a flange which dips into a well, and thus affords a liquid seal. Passing into the receiver end of the tower, and directed towards the plate, is the gas inlet pipe. In the operation of scrubbing and washing, the ammoniacal liquor is pumped continuously from the receiver to the spraying devices. The liquor passes from the latter into a state of intimate comminglement with the gas, and descends towards the perforated frusto-conical elements in the form of a mist. The liquor collected in these elements is directed over the edges as a series of cascades through which all the gas to be scrubbed or washed is constrained to pass, the liquor flowing through the liquid seal and thence towards the receiver. For the purpose of removing traces of ammonia from the gas, a purifier is fitted at the top of the tower; the purifier comprising a series of spraying devices, a cascade forming device, and a liquid seal. The excess of spray reaching the liquid seal is exhausted by a pipe communicating with a suitable storage tank.

The gas ascends, either through the perforated elements or under the bottom edges of the imperforate elements, through the cascade formed by the liquid falling through the perforations. The liquid seal serves to wash the gas by bringing the tarry matter contained therein into direct contact with the liquid contents of the seal, so as to separate the tar globules from the gas in its passage through the liquid; the tar overflowing with the down-coming liquid to the bottom of the washer. The washing process referred to consists of the interaction of crude gas with weak ammoniacal liquor, neutralizing the CO_2 and H_2S contained in the gas. The apparatus may be used for scrubbing and washing coal gas or water gas.

The following result was obtained on an official test carried out some time ago by a neutral authority and myself:

Grains NH_3 per 100 c.ft. gas at inlet to apparatus 210
" " " " outlet from " 17
Efficiency = 91·9 p.ct.
Quantity of gas passing per day . . . . . 2,688,000 c.ft.
Strength of liquor at inlet. . . . . 0·99 p.ct. NH_3
" " " outlet . . . . . 1·24 " "
" " water at outlet . . . . . 0·78 " "
Quantity of water passing per hour = 60 gallons = 0·5 galls. per 1000 c.ft.

(To be concluded.)

A Safety Suggestion for Motor Fuel.—Motor gasoline, it seems, is often mistaken in America for water, kerosene, or some other colourless liquid, with frequent resultant explosions and fires; and as a safety measure designed to guard against this, the suggestion has been advanced by Mr. W. A. Jacobs that all motor gasoline should be coloured red—which is considered almost universally to be an indication of danger. Mr. Jacobs is Chemical Engineer to the Department of the Interior, and was specially detailed by the United States Bureau of Mines to make a study of the hazards of gasoline.

Gas Referees' Notification.—There has been re-issued the General Notification of the Gas Referees, under the Gas Regulation Act, 1920, which was published originally in June last, and fully reviewed in the "JOURNAL" dated July 11, p. 251. A supplementary notification of Dec. 15, 1923, is now included, which makes some additions and alterations to the original document. This supplement apart is not on sale; but copies will be supplied by the Gas Referees to gas undertakings, local authorities, and gas examiners for whom the general notification issued on June 15 last has already been prescribed. The re-issued general notification, including the supplementary variations and additions, is published at the price of 1s. net, postage extra, by H.M. Stationery Office, Imperial House, Kingsway, W.C., and branches.

Institution of Petroleum Technologists.—Mr. A. E. Dunstan, in the course of a paper read before the Institution, said that the advantages of the hypochlorite process of refining, as compared with the use of sulphuric acid, may be summarized as follows: (1) There is less loss on refining, for no aromatic hydrocarbons are lost in the form of sulphonic acids. (2) No acid sludge is formed, and no acid recovery plant required. (3) The treatment can be carried out in ordinary steel vessels, since corrosion of washers, piping, &c., is much less than is the case when acid is employed. Lead-lined apparatus is not required. (4) The sum total of operations is easier to carry out than the acid-refining process with the acid recovery, &c., incident to the latter. (5) The process is applicable to the light distillates from all types of crude petroleum which contain sulphur.

THE LABOUR PARTY AND BETTER TIMES FOR THE HOUSEWIFE.

[COMMUNICATED.]

In an article by Mr. Herbert Morrison, of the London County Council, entitled "Better Times for the Housewife"—reprinted from the London Labour Chronicle of February, March, April, and May, 1923—and published in booklet form by the Labour Party, Eccleston Square, S.W. 1, one regretfully notices that the author unnecessarily seeks opportunity unfairly to disparage the use of gas in order to "boost" electricity for general domestic purposes. It is a little difficult to understand why Mr. Morrison should go out of his way to deprecate such a widely used and highly beneficial commodity. Gas, as a domestic fuel, has done much to lighten household labours in an increasing degree for the past twenty-five years or more; and to-day it is employed for a variety of purposes by 96 p.ct. of the families of this country, the aggregate population of which is something over forty millions.

Mr. Morrison would like to save the busy housewife much domestic drudgery by electrifying the home (he advocates the use of electricity for cooking, room warming, water-heating, &c.); but he is, presumably, so prejudiced against the use of gas—or perhaps it would be more correct to say the private ownership of gas undertakings—that no mention is made as to the great part which gas has played, is playing, and has still to play, in making more generally available the labour-saving home.

FACTS ABOUT GAS.

There were, on Dec. 31, 1922, about eight million consumers of gas—that is, eight million meters in use (of which 55 p.ct. were slot meters); and more than sixteen million gas cookers and fires (or, roughly, one cooker and one fire to each consumer). Forty thousand miles of gas mains were laid, through which a total of 230,000 million c.ft. (or 5·8 millions per mile of main) were sold during the year. The figures relating to gas cookers and fires apply, of course, only to stoves let out on hire; and if it were possible to obtain a census of the privately owned appliances, including wash boilers, water heaters, &c., the average number of fuel appliances in use per consumer would be found to be well in excess of two. Throughout the whole of the country gas is making great strides as a fuel for domestic and industrial purposes. In 1900 the total amount of gas sold was 140,000 million c.ft., and there were 27,600 miles of main in use. In twenty-two years, total sales have, therefore, increased by nearly 80 p.ct., while the annual sale per mile of main has risen from 5·1 to 5·8 millions.*

In an editorial article in "THE GAS SALESMAN" for Oct. 31, 1923, it is stated that:

> "At the annual conference of the British Commercial Gas Association, in Birmingham, Mr. F. W. Goodenough called attention to the fact that, taking the last twenty years, the past five years have shown a greater rate of increase than the preceding three quinquennial periods—that is, in respect of the statutory gas undertakings whose statistics appear in the Board of Trade returns. In the ten years ending 1912, the increase in gas sales was 45·6 thousand million c.ft.; in the ten years ending 1922, the increase upon 1912 was 60 thousand millions. Of the increase in the decade ending 1912, ordinary consumers accounted for 10 thousand million c.ft.; and the prepayment consumers for 35·6 thousand million c.ft. Of the increase in the decade ending with 1922, the ordinary consumers accounted for 31·3 thousand million c.ft.; and the prepayment consumers for 28·7 thousand million c.ft. . . ."

These figures should be sufficient to show that the gas industry is in anything but a decaying condition. Such satisfactory progress in the sale of gas during years of abnormal prices speaks with unquestionable certainty as to the appreciation by the public of its many virtues; and one cannot avoid thinking that Mr. Morrison would have better devoted his energies to calling attention to the uses of gas as well as of electricity, instead of ignoring the former except in so far as it enables him to advertise the latter.

FACTS ABOUT ELECTRICITY.

Mr. Morrison refers to what electrical science can do for Mrs. Worker; but the statistics herein given as to the large amount of gas sold to prepayment consumers clearly point to what gas has done. One realizes that this gentleman is very inconsistent, for he would seek to give "better times to the housewife" by sacrificing employment for Mr. Gasworker. There can be no other deduction formed from his remarks. He would replace gas by electricity; and in seeking to do this he is not helping one section—and a very large section too—of the workers in this country. In fact, he is operating against the interests of tens of thousands of workpeople who find congenial employment in the gas-supply industry and its allied trades. It would, therefore, appear that Mr. Morrison is acting the rôle of electrical propagandist and using the plea of altruism to disguise his activities. Whatever Mr. Morrison says, however, he has yet to learn a good deal about the true comparative costs of gas and electricity for fuel purposes in practice. He cannot cause one unit of electricity (even though it be utilized in appliances giving 100 p.ct. efficiency) to develop a greater number of B.Th.U. than 3420. Further, he is incapable of formulating any scheme for adoption in this country whereby electricity can be generated and distributed at a price equal to the average cost of gas for actual services rendered, if the supply undertaking is to pay its way. It is conjectured that he would subsidize the cost of supplying electricity to such an extent as to render the charge to the consumer low enough to enable the masses generally to adopt electrical energy for fuel purposes. While recognizing the impracticability of this, one wonders how the vast majority of England's citizens could avail themselves of "cheap" electricity; for it is well known that the prices of electric cookers, heaters, water-heaters, &c., are two and three times the cost of gas appliances. It can only be assumed that Mr. Morrison would seek to make further demands upon the pockets of the taxpayer by providing these appliances at "nominal rentals," or loaning them without charge.

Further to pursue the financial aspect of this matter would be to introduce politics and economics in a greater degree than is desirable in an article of this nature; and it can only be said that to subsidize heavily a modern industry, in order that it may compete with—or, rather, as apparently Mr. Morrison would have it, supersede—an older established and more firmly rooted one which pays its way, is the height of absurdity. If it is Labour's policy to cheapen the cost of electricity, it surely is not its policy to cripple and curtail the progress of a "key" industry of such national importance as is the gas industry.

THE BEE IN THE BONNET.

Let us now examine some of the anti-gas and pro-electric statements which Mr. Morrison makes. He remarks:

> "It is airily said in a conclusive way that a therm of gas costs less than a therm of electricity; and 'there you are.' In making comparisons on this basis it has always to be remembered that in use the consumption of electricity is much more economical than the consumption of gas. In burning gas it is also necessary to consume appreciable quantities of cold air which have to be heated up to a flame temperature, most of it being thrown away. In the case of electric cooking it is only necessary to heat the still air in the oven; and the heat thus secured is conserved to such an extent that it is not necessary to have the current switched on (in any case fully) during the whole of the period of most cooking operation. The housewife need not look continually in the oven, thereby dissipating its heat."
>
> "Electricity cooks by time, and the housewife of average intelligence will soon learn to enjoy the sense of security which is obtained by cooking by the clock; and the absence of smell and heat, together with the improved character of the cooked food, are great advantages."

He further states:

> "Generally speaking, 6d. or 7d. a unit for lighting, and 1d. to 1½d. for cooking, are rates calculated to give the user real satisfaction and to bring the many advantages of the electric method at little or nothing more than the cost of the old-fashioned alternatives. The unit at 1d. to 1½d. for cooking in many districts, brings a distinct money-saving in addition. Similar considerations apply in the case of electricity for heating."

Mr. Morrison mentions also the electric iron and the electric water-heater; and one of the apparently very few accurate statements which he makes appears in the following sentence:

> "While boiling in general has been a not altogether easy problem in connection with electricity, new inventions have evolved, and are evolving, which will soon solve this problem, if indeed it is not already solved."

Let it here be remarked that competent electric engineers are far from happy on the point of solving boiling and water-heating propositions. But let all other considerations, except that of cost, be ignored.

FACTS.

The appended statements show the comparative running costs of gas and electricity for various domestic services, based on a charge of 9d. per therm for gas for lighting and heating, and 6d. per unit and 1d. per unit (lighting and heating respectively) for electricity. These latter are the lowest prices Mr. Morrison puts forward, and are tariffs which do not generally obtain. Even so, it is difficult to see how this gentleman can substantiate his statement that the suggested rates are "calculated to give the user real satisfaction and to bring the many advantages of the electric method at a little or nothing more than the cost of the old-fashioned alternatives."

Domestic Lighting.

Gas at 9d. per Therm.	*Electricity at 6d. per Unit.*
A medium inverted burner of the ordinary type, taking 1500 B.Th.U. per hour, yields, at a fair working efficiency of 25 B.Th.U. per candle-hour, 60 c.p.*, and costs 0·135d. per hour.	A 40-watt electric lamp of the gasfilled type yields—at its maximum efficiency (*i.e.*, when new) of 0·66 watt per candle—60 c.p.*, and costs 0·24d. per hour.

* NOTE.—These ratings are in terms of mean horizontal candle power.

Actually, therefore, electricity for domestic lighting is approximately 80 p.ct. more costly than gas.

* NOTE.—The foregoing figures were given by Mr. George Evetts, M.Inst.C.E., in a paper entitled "Recent Developments in the Production of Town Gas," lately presented to the Institution of Engineers-in-Charge. [See "JOURNAL" for Dec. 19, 1923, p. 775.]

Cooking.

Gas at 9d. per therm; electricity at 1d. per unit.

Experimental and practical working tests—the accuracy of which has been substantiated by the comments of disappointed users of electric cookers, who have reverted to the employment of gas, have shown that at least 20 units of electricity are needed to perform the same services as one therm of gas. 20 units at 1d. cost 1s. 8d.; 1 therm costs 9d.; ratio in favour of gas = 2¼ : 1 (approx.).

NOTE.—The gas-cooker on which these tests were made was of fairly old design—of the type commonly supplied for years on rental at one to two shillings per quarter, according to size—but the electric cooker chosen for comparative purposes was of modern manufacture, one for which a rental of 11s. per quarter is asked in a South London residental district. The thermal efficiency of the latest type of gas-cooker is of as high an order as that of the most highly-perfected electric cooker; and it follows, therefore, that the respective prices of a therm of gas and 100,000 B.Th.U. produced electrically at once reveal the relative costs of cooking by the two agents. Twenty-nine units are capable of developing just under 100,000 B.Th.U. (3420 × 29 = 99,180) and cost at 1d. per unit 2s. 5d., as against 9d. for a similar number of heat units obtained by the combustion of gas. On this basis of comparison, the ratio in favour of gas is rather more than 3 : 1.

Nota Bene.—The term "cooking" referred to above must be understood to relate to general hotplate and oven work. In actual practice, of course, the hotplate does the lion's share of the work—a fact which electrical propagandists find a little troublesome. (See Mr. Morrison's remarks on boiling water by electricity.)

Actually, therefore, electricity for cooking is two to three times as costly as gas.

Room Warming.

Gas at 9d. per Therm.	*Electricity at 1d. per Unit.*
Gas-Fire.	*Incandescent Electric Heater.*
A 7-burner (or 10 in.) gas-fire, taking 17,500 B.Th.U. per hour, costs a fraction over 1½d. per hour and, giving it the modest efficiency of 60 p.ct.* (radiation 45 p.ct. and convection 15 p.ct.), delivers into the room 10,500 B.Th.U. per hour.	A 3-kilowatt electric heater costs 3d. per hour, and is approximately equal in heating capacity to a 10-in. gas-fire of modern design. Giving this electric heater 100 p.ct.† efficiency, it delivers into the room 10,260 B.Th.U. per hour.

* NOTE.—The remaining 40 p.ct. does not represent wasted energy; for the injector-action, caused by the upward travel of the products of combustion in the chimney to which the gas-fire is attached, promotes the required aero-motive force necessary to ventilate a room properly.

†NOTE.—This efficiency of 100 p.ct. can only apply in cases where the heater is so placed as to exert no influence upon the air changes in a room. Therefore, in these circumstances, hygenic requirements would be disregarded in favour of the attainment of maximum thermal efficiency.

Actually, therefore, electricity for room warming is twice as costly as gas.

Bath Water Heating.

Gas at 9d. per Therm.	*Electricity at 1d. per Unit.*
Gas.	*Electric.*
A 20-gallon bath by gas geyser costs a fraction under 1½d. and requires, at a fair operating efficiency of 85 p.ct., an expenditure of 16,470 B.Th.U. (approx.).	A 20-gallon bath by electric geyser, for which an efficiency of 90 p.ct. is claimed, costs a little more than 4½d., and requires an expenditure of 15,555 B.Th.U., with their approximate electrical equivalent of 4·5 units. $\left(\frac{15,555}{3420^*}\right)$

NOTE.—B.Th.U. required at 100 p.ct. efficiency = weight of water in lbs. × rise in temperature in degrees Fahr. = 200 (120–50) = 14,000.

These calculations assume that 20 gallons of water have to be raised from an average cold temperature of 50° Fahr. to a temperature of 120° Fahr. at the spouts of the respective geysers, in order that the "bulk" temperature of water in the bath may be two or three degrees over the nominal "bath" temperature of 100° Fahr.

$\frac{14,000 \times 100}{85}$ = B.Th.U. required by gas geyser at 85 p.ct. efficiency = 16,470 (approx.).

$\frac{14,000 \times 100}{90}$ = B.Th.U. required by electric geyser at 90 p.ct. efficiency = 15,555.

* 1 unit of electricity is capable of developing 3420 B.Th.U.

Actually, therefore, electricity for bath water heating is three times as costly as gas.

Clothes Boiling.

Gas at 9d. per Therm.	*Electricity at 1d. per Unit.*
Required to raise (say) 6 gallons of water at an average cold temperature of 50° Fahr. to boiling point (212° Fahr.).	
Gas.	*Electric.*
Ordinary boiler of 10 gallons capacity, with copper pan and galvanized iron casing (gas-burner beneath pan), operating at a moderate efficiency of 50 p.ct. B.Th.U. required by gas-boiler = 19,440, costing just under 1¾d.	Lagged vessel of 10 gallons capacity, with electric heating element arranged in the base as an integral part of the appliance, for which an efficiency of 80 p.ct. is claimed. B.Th.U. (converted to B.O.T. units) required by electric boiler $= \frac{12,150}{3420^*} = 3·5$ (approx.), costing 3½d.

NOTE.—B.Th.U. required at 100 p.ct. efficiency = weight of water in lbs. × rise in temperature in degrees Fahr. = 60 (212–50) = 9720.

It is here assumed that 6 gallons of water in a boiler of 10 gallons capacity will allow for the space occupied by the clothes.

$\frac{9720 \times 100}{50}$ = B.Th.U. required by gas boiler at 50 p.ct. efficiency = 19,440.

$\frac{9720 \times 100}{80}$ = B.Th.U. required by electric boiler at 80 p.ct. efficiency = 12,150.

* 1 unit of electricity is capable of developing 3420 B.Th.U.

Actually, therefore, electricity for clothes boiling is twice as costly as gas.

Ironing.

Gas at 9d. per Therm.	*Electricity at 1d. per Unit.*
Internally-heated nickel-plated gas-iron.	*Internally heated nickel plated electric iron.*
The popular size of modern gas-iron, taking 2500 B.Th.U. per hour, costs less than ¼d. per hour.	A 0·5-kilowatt electric iron—approximately equal in size and weight to the gas-iron under comparison—costs ¼d. per hour.

In practice it has been proved that 4 to 5 hours' ironing can be done for one pennyworth of gas. Actually, therefore, electricity for ironing is twice as costly as gas.

GAS "MORALE."

In conclusion, let it be said that gas-appliances are in ever-increasing demand by the public; and gas has rightly been christened "Mother's Third Hand." Typifying woman's appreciation of gas in the home may be mentioned this instance. On the bust of Murdoch at the Birmingham Gas Exhibition was placed a bunch of pansies with a card attached bearing these words:

> "Pansies for thoughts—from a woman—one of the millions who are grateful for the boon of gas and who think kindly of the discoverer."

Sir Frederick Mott has recently said:

> "The simplicity of cooking by gas and the possibilities of the utilization of gas by automatic meters in the homes of the poor will certainly enable children to apply in their own homes the knowledge they acquire in the schools."

We of the gas industry doubtless share the optimism of Mr. Goodenough, which manifests itself in his remark:

> "The field of development of the gas industry is not only far from exhausted, it is only just beginning to be touched."

With such splendid opportunities as are presented to us for rendering efficient public service, we do not feel that the ambition of Mr. Morrison, as set out in his pretentious article, can stem the tide of increased gas utility in the home and factory. Let 1924 witness a greater determination on the part of all to keep the flag of prosperity flying. Enthusiasm is the keynote of success.

CAREERS IN INDUSTRY AND COMMERCE.

By F. W. GOODENOUGH.

[An Address at a Conference of Educational Associations.]

Addresses dealing with both the employers' and the employees' sides of the subject of "Careers in Industry and Commerce" were delivered last Thursday at a conference of Educational Associations held in University College, Gower Street, under the auspices of the Association of Education in Industry and Commerce. Viscount BURNHAM (the President) was in the chair; and he said the Association were trying to carry still further education for life, which would have no meaning in an industrial community like that of this country unless it touched industry and commerce. Wherever he went he found universal testimony to the fact that employers and managers were taking a personal interest—which they never showed in days gone by—in the course of technical training in their particular callings. At the same time, the work of the Association was helpful to the employers, because it gave the means of comparing results and drawing from them the lesson as to how to carry out the responsible duty of making the best of their strength in their various industries—among other means, by work schools.

Mr. F. W. GOODENOUGH (Executive Chairman of the British Commercial Gas Association) addressed the meeting in the following terms, from the employer's point of view.

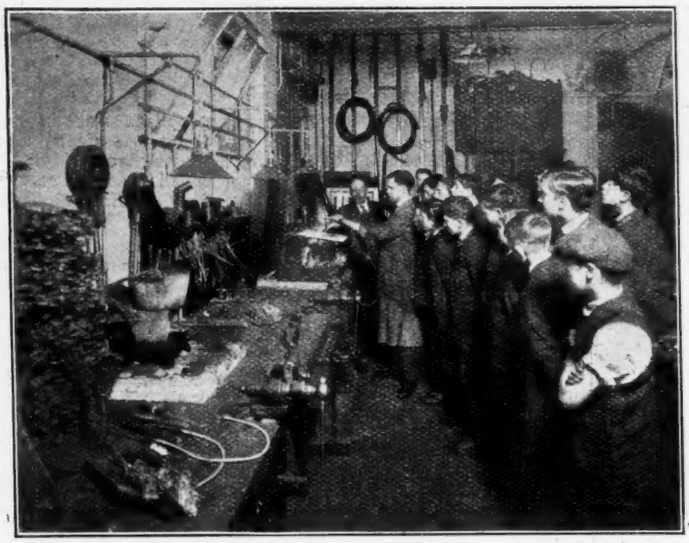
WHAT THE GAS INDUSTRY HAS DONE.

The question of careers in industry and commerce is one of as real and great interest to employers as it is to those engaged in educating future candidates for employment, as to those candidates themselves when they come to consider the question of their future. During the past century of industrial development and progress, the attention of employers has been mainly directed towards the perfecting of the mechanical side of manufacture and distribution; but for many years now a steadily growing number of employers have realized that, for the fullest and best development of industry, it is of the highest importance that most careful and thorough attention should be given to the education, training, and development of the human factor in industry.

All employers who take this view of their needs and responsibilities welcomed, therefore, very heartily the establishment of the Association for Education in Industry and Commerce, and are glad to do anything possible to strengthen its hands; and I am very pleased to be given this opportunity of expressing the indebtedness of employers to the Association for its valuable work, and of making a small contribution towards the proceedings of this conference, though I fully realize my inadequacy for the task. The main reasons, I presume, why I have been asked to deal with the question of careers in industry and commerce from

the employers' standpoint, and especially the question of the young employee, are:

(1) That I happen to be the Executive Chairman of an Association representing one entire industry for Great Britain and Ireland, and Chairman of the Advisory Committee on Education for that industry—a Committee upon which we are glad to have the valued assistance of representatives of the Board of Education.



This picture gives an insight into the work done in the general training shops. When a new class of apprentices arrives, the potential dangers of the work in shops and on the district are explained to them by the instructors in the Company's workshops. The boys are shown how to avoid accidents when dealing with molten metal, with live gas, with the unloading of tubes filled with lead, resin, pitch, and so forth. "Safety First" is the first principle instilled into the minds of the lads.

(2) That the industry I represent employs women as well as men, though the latter very largely predominate.

(3) That there have been definite training schemes in operation in the industry for many years, both by way of apprenticeship and by other methods of encouraging education and providing training.

(4) That the gas industry provides openings, not only for professional engineers, but also for those seeking employment in all branches of administrative, office, commercial, technical, and technical-commercial work.

(5) That, in our industry, even the boys who start straight from elementary schools in the lowest grade of the industrial or commercial side need never consider themselves in a blind-alley occupation.

(6) Finally, that the industry has almost from the beginning been a member of this Association, and in sympathy with the valuable work it is doing.

All interested in this subject will no doubt have read Mr. Arnold Freeman's book entitled "Boy Life and Labour," which received endorsement in a preface by no less an authority than Sir Michael Sadler, and embodies the results of an investigation undertaken at the request of the Education Committee of the Birmingham City Council. Valuable as that book is, I cannot but feel that it takes a somewhat unduly pessimistic view so far as many organized industries are concerned. Mr. Freeman in his book says:

> Owing to the industrial and mechanical developments . . . the greater part of the work of the world must be uneducative and low-skilled. We may abolish without much difficulty many boy occupations, but whatever substitutions we may make will not alter the fact that the boy can, as a rule, learn nothing of value through his work.

Now I hope to show you from the slides which I will presently have put on the screen that, so far as the gas industry is concerned, we have done something to prove that this sweeping generalization is not true; and I want to express not only the hope, but the belief, that this Association may be instrumental in making that generalization entirely untrue for all British industry, even if that end be reached only by degrees and slowly.

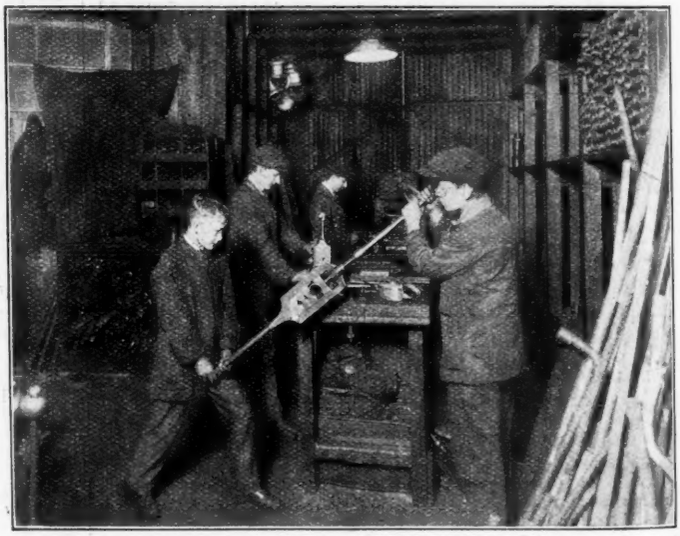
If only the true craft spirit can be brought back into British industry—even in connection with repetition processes—there is no reason why any human being should be spiritually sacrificed to the material machine. In order that we may all—employers on the one hand, and educationists on the other—work together towards the achievement of this, it is necessary that we should consider an answer to this question: Assuming that modern industry does, and can, give scope to the human employer with true social as well as economical instincts, what does he look to the schools to provide him with in the shape of educated boys, if he is to assume and rightly fulfil responsibility for the development into manhood of the youths of from 14 to 16 years of age, who come to him at the commencement of their careers?

I reject without qualification Mr. Freeman's view that large numbers of boys and girls must necessarily be sacrificed to some fearful monster called "Modern Industry," and that the only cure for the present evils in regard to juvenile employment is the smashing of the present industrial system. That is to take a very materialistic, almost a heathenish, view. Man is greater than the machine he has created, and if man so desires he can use this mighty machine for good, and good only. It is of the greatest importance that those entrusted with the education of our boys and girls should not allow this false idea of modern industry to possess their minds or to grow in the community. That is the way in which to perpetuate such evils as exist and to foster their growth, rather than to bring about their gradual amelioration and ultimate abolition.

If those who prepare the raw material out of which our adult workers are to be wrought, and those who are the "human bits of raw material" look thus upon industry as a relentless dehumanizing machine, so that our young people approach their life's work in that spirit, there is bound to be deplorable waste of human material and grave hindrance to true progress. If, however, they take the view that "this is an industrial age, let us make the best of it, let us determine that the material shall be governed by the spiritual, and not the spiritual by the material," then will the employers who already realize their responsibilities and the needs of the age be better able to work for their ideals and be better able to prove to less enlightened employers that the way of right is also the path of true industrial prosperity.

What the Employers Wish the Schools to Do.

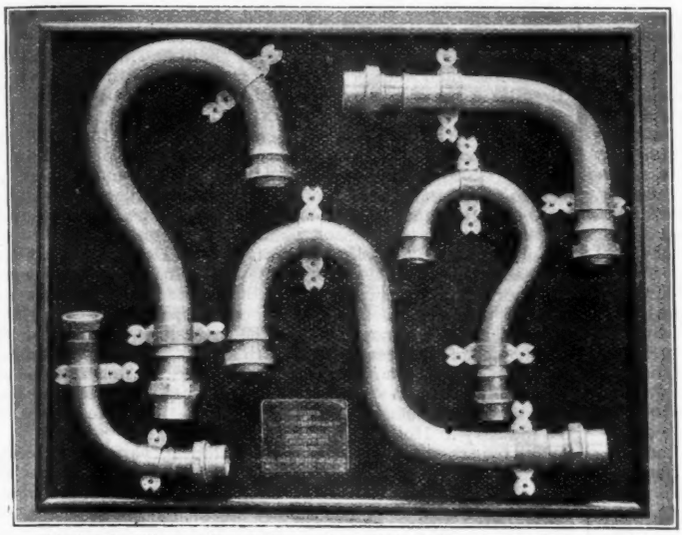
What is it, then, that we employers ask of the schools, and how can we best explain to you who represent the educators and trainers of youth what we want? First, let me say what we do not want—we do not want or expect the "finished article." We do not expect or wish the schools to send us amateur craftsmen or amateur clerks. What we do want is that you shall send us boys and girls fired with ambition and determination to be tryers, and imbued with the belief that in the ranks of industry and commerce they can make themselves first-class craftsmen or first-class clerks, or first-class salesmen or managers, because of the foundation given them at school, upon which they can build their life's education and training. We want boys and girls who have been taught how to learn and how to think, and—a most important point—how to express their knowledge and their thoughts in lucid, logical, grammatical, and correct English. We want you, in short, to deal with and inculcate principles, leaving employers to see to their practical application to industry and commerce as the boys and girls grow into men and women.



Gaining practical experience in the use of various types of stocks and dies for putting threads on piping.

Moreover, we want you, with your knowledge of physiology and psychology, to do something towards the sorting of the raw material; to make it more easy to put round pegs into round holes

and square pegs into square holes. Although you can do a great deal, you cannot do everything you might or would in this connection, because of the early age at which boys and girls leave school—too early unless they are fortunate enough to choose a career where there is some definite form of organized training in works or shop to take the place of the best side of the old apprentice training. A child of 14 or 15 is too young to progress satisfactorily by merely picking up a craft. He will run the risk of



Illustrating the quality of the work turned out by the apprentices within twelve months of the commencement of their apprenticeship.

the man in "Pilgrim's Progress" who merely picked up the unconsidered trifles, and may eventually drift into the semi-skilled ranks or become a "Jack of all trades," when he might have been a first-class artisan and a leader of others.

How Teachers can Help.

May I express the opinion that the teachers of this country could, and the hope that they will, make themselves more helpful

A class of apprentices receiving practical instruction in the laying of mains. They open up a trench in which they lay 4-in. cast-iron pipes. After the main has been made "live" (*i.e.*, filled with gas), they cut it and insert a branch after having "bagged back" the gas.

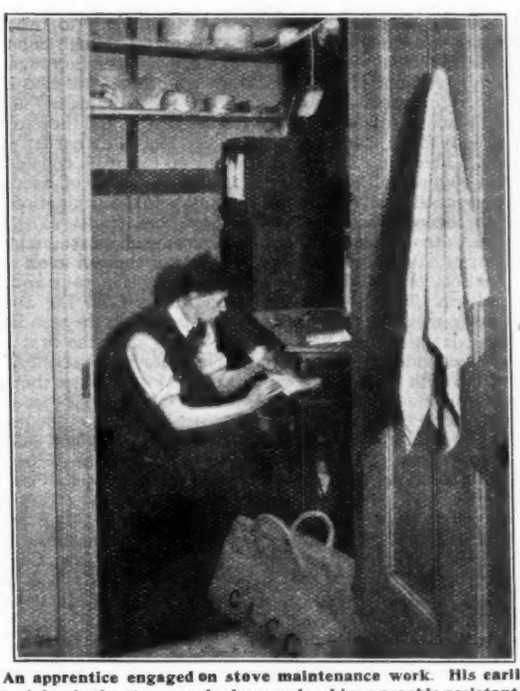
to the children under their care by themselves learning more about the industry and commerce in which their pupils hope to find careers. I wish they would, in an industrial age, seek every possible opportunity, which employers would gladly afford them, of learning more at first hand of the working of industry. I am sure that if the educationists—administrators as well as teachers and trainers—knew anything like as much of the inside of industry (on its human, as well as its material side) as they know of the inside of books, they would be of vastly more service to their pupils and their pupils' parents when it comes to starting the young people on their life's work. They would, moreover, be better able to make use of the great body of goodwill there is among employers of labour, by helping to mobilize it, and to show employers how they can carry on and finish the good work begun in the schools.

That brings me back to the first requirement I stated—namely, that you teachers should look upon your task as the beginning of a work which is life-long, for which you are merely building a sound foundation; and that you should therefore hold out the hand of comradeship to the employer, and help to make him your successor in the work of training and educating the pupils that have passed through your hands. The boys will be workmen for a far longer time than they are schoolboys. You teachers can only make a beginning with the life-work of education. The important thing is that it should be a true beginning, a useful—a permanently useful—foundation for the future, something that cannot be easily undone. School-work that leaves the boy with the feeling "Thank heaven I have finished with school, now I can begin to do something useful," or that gives the average employer the feeling "Here's a promising youth, now I must begin to teach him something practical in place of the useless stuff he has learnt at school," is profoundly wrong. I believe it to be becoming less general, though I know from practical experience that great improvement is still absolutely necessary.

What is wanted to bring about that much needed improvement is greater understanding and co-operation between educationists and employers.

I am now going to show you briefly something of what is being done in our industry as the result of such co-operation and understanding; and it is because I believe that this Association will do much to spread the growth of such mutual service to the generations of the future that I am happy to have had this opportunity of addressing you to-day.

Mr. Goodenough then showed a number of slides illustrative of the work of the Gas Light and Coke Company's apprentices at the Westminster Technical Institute of the London County Council, and subsequently on the district. He pointed out that the whole scheme is worked in co-operation with the local Education Authority. The pictures depicted clearly the methods adopted to give the lads a sound knowledge of their trade inall its branches, and to develop both their mental and physical powers.



An apprentice engaged on stove maintenance work. His earlier training in the stove repair shops makes him a capable assistant to the stove maintenance fitter. His general training enables him to answer sensibly most of the questions which are put to him from time to time by consumers.

Lord Burnham, in drawing the proceedings to a close, said it seemed quite clear that much more was being done than had been done hitherto to link-up work schools and apprenticeship classes with the local education authorities. It was essential, of course, that there should be full understanding and mutual co-operation between the local education authority and those engaged in the great firms in conducting classes in schools, in order to attain anything like satisfactory results.

CITY AND GUILDS OF LONDON INSTITUTE.

Report on the Work of the Session 1922-23.

WHILE making intimation of the publication by John Murray, Albemarle Street, London, W., at the price of 1s. net, of the report on the work of the Department of Technology of the City and Guilds of London Institute for the session 1922-23, it may be pointed out that copies of the programme for the school year 1923-24 (published by Mr. Murray) may be obtained from Messrs. Lamley and Co., Nos. 1 to 5, Exhibition Road, London, S.W. 7, price 3s. 6d. net, postage 5d. extra. The general regulations and all syllabuses are printed therein in full.

Turning to the report for the past session, it is learned that, for the examinations in Great Britain and Ireland in technical subjects as a whole, a small decrease in the number of candidates has to be recorded. This decrease from 9133 in 1922 to 8707 in 1923 is spread generally over a wide range of subjects, and is attributed in the main to the depressed condition of industry. The entries for the two grades of Gas Supply increased from 217 to 338; and it is gratifying to note the statement that a high standard of knowledge was reached by those who took the final grade. The recommendation, mentioned in the report for the previous year [see "JOURNAL" for Dec. 6, 1922, p. 616], that actual installations carried out by final candidates in Gasfitting in the course of their daily district work should be inspected by Local Examiners, was put into force in 1923, and 39 inspections were successfully carried through. The *viva voce* examinations in the same subject were held in the morning, prior to additional practical tests in the afternoon; and it is again gratifying to learn that a good standard of general ability was shown by the candidates after the searching tests to which they were subjected.

During the session 1922-23, with the consent of the Board of Education, the Institute's Grade I. examinations in Gas Engineering and Gas Supply, and in Grade II. of Gasfitting, were held in England and Wales. The first two examinations will not be held this year in England and Wales; but the application made for the continuance of lower examinations in other subjects having been granted by the Board of Education, these will again take place. However, the effect of the discontinuance of the earlier examinations of the Institute has not ceased to receive attention; the Technology Committee being more and more convinced, by experience, of the difficulty of getting good results in examinations that are not so graded as to concentrate the attention of students first on the elementary knowledge on which alone advanced knowledge can be effectively built.

While admitting that any such general statement needs to be qualified in some cases and in several respects, the Committee say that, upon reading the Examiners' reports on the examinations of the session under review, it is difficult to resist the conclusion that technical education in many, though not in all, subjects, far from showing any advance, is less thorough than formerly. A number of the Institute's most experienced Examiners have independently reported that the candidates' answers are not reaching the standard of former years; and they attribute this directly to the discontinuance of the Institute's earlier examinations. There is, the Committee go on to say, a considerable body of opinion to the effect that a large number of candidates now present themselves for the Institute's final examinations who have not been sufficiently prepared for this grade. The result too often is that they either fail and become disheartened owing to their not having received the stimulus of success in an earlier examination, or that they obtain a second-class pass and then rest content. Among other cases quoted, in Coal Tar Distillation the report is that the answers were not up to the standard of the final examination, and that "it looks as if the first year's work of the students had been of too elementary a character." In connection with Coke and Bye-Products Manufacture the same complaint is made.

There are in the report the usual tables which give the general results of the examinations, with details of passes and failures; and these show the percentages of failures to have been as follows: Coke and Bye-Products Manufacture, 45·5; Coal-Tar Distillation, 38·9; Dyes and Colouring Matters, 26·9; Gas Engineering, 31·5; Gas Supply, 26·9; Gasfitting, Grade II., 30·4; Gasfitting, Final, 12·8. The number of candidates presenting themselves was: Coke and Bye-Products Manufacture, 22; Coal-Tar Distillation, 18; Dyes and Colouring Matters, 26; Gas Engineering, 238; Gas Supply, 338; Gasfitting, Grade II., 98; Gasfitting, Final, 39.

The fees for examination have in general been increased.

Tank-Wagon Danger.—The 1922-23 report of the Swiss Gas-Works Inspectorate calls attention to a number of faults in building and plant construction; but they have fewer grounds for complaint than in the preceding period. Of the accidents which they investigated, one involving injury to two workmen through the explosion of a tar tank-wagon spells a lesson. It seems that the tank had contained sulphuric acid, which, acting on the plates, filled it with an explosive mixture of hydrogen and air. The men proceeded to unseal the cap by means of a red-hot awl—with regrettable consequences. Tank-wagons, it is considered, should be filled with water and thoroughly rinsed-out before being taken into commission.

THE DUTCH GAS ASSOCIATION.

Jubilee Meeting.

Like the sister association in Switzerland, the Dutch Gas Association last year celebrated its fiftieth anniversary. The jubilee meeting was held in Amsterdam on Oct. 15 to 18, and we were able to give an account ["JOURNAL" for Oct. 24, 1923, p. 251] of the exhibition held in connection with it. We are now able, from a report in a recent number of "Das Gas- und Wasserfach," to place on record a few details of the meeting itself.

Herr O. S. Knottnerus was in the chair, and his name, as well as others which were prominent in connection with the meeting—Brender à Brandis, Terneden, Bolsius, among many others—will doubtless remind many members of the English gas industry of pleasant visits to Continental meetings, especially the Rotterdam meeting shortly before the war. Representatives of the English, French, German, and Swiss Associations were present on this occasion to bring good wishes from their respective lands; and, doubtless with intention, the international character of the industry and its work was much in evidence, both at the meeting and in the exhibition. Besides notable representatives of Holland, Dr. Charles Carpenter, M. Laurain, and Prof. Dr. Hans Bunte were made members of honour of the Dutch Association, and, through them, honour was paid to the Associations respectively of England, France, and Germany. Herr Knottnerus, who had held the Presidency of the Association five times previously, was inscribed as first member on a roll of honour founded in celebration of the jubilee. The first day's sitting closed with references to numerous others who are remembered with gratitude for their services to the industry in Holland.

The papers put down for reading included a variety of subjects, but time did not permit of full justice being done to them all. Prof. G. A. Brender à Brandis gave a general survey of the activated charcoal process, which has claimed so much attention of late—at any rate, on the Continent—in connection with the recovery of hydrocarbons and with sulphur purification. Utilization of Waste Heat, Sampling and Analysis of Coal, a New Complete Gasification Plant, and Gas-Supply Propaganda were other subjects dealt with.

A description by Herr Petit of the technical and commercial principles of the Hoogoven en Staalbedrijf in Velsen preceded a visit to their almost completed new coke-oven and iron works. On a note of envy, the German critic observes that in that "happy land" evidently it is not necessary, as in modern Germany, for everything in works planning to give way to economy, to pinching and scraping in fuel, to using up every scrap of waste energy, even at the cost of efficiency in other directions, until the German engineer feels he is first and foremost a "hunter after heat units."

The meeting was exceptionally well attended, the number being over 280. Herr J. E. H. Backhuis was elected President for the ensuing year.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Domestic Electrification.

SIR,—In your issue of Dec. 12 last, p. 720, you published a letter from Mr. Hardie, of the Glasgow Corporation Electricity Showrooms, and I am very much surprised that not a single comment has so far been made upon it.

Mr. Hardie more or less accepts the correctness of the figures for the all-gas house. May I ask him where the electric figures came from? Will he kindly state the number of units used, and the price per unit? Is it the case that the all-electric houses in Glasgow received current at preferential rates? Does he really think that number of rooms, or amount of rent, has the slightest bearing on comparative consumptions? Why does he not compare the cost of equal amounts of heat from electricity and gas used in houses with equal requirements, irrespective of the size of the house?

These are a few of the questions which arise out of Mr. Hardie's letter, and perhaps he may have something further to say in answer to them.

WALTER M. PATERSON,
Bath Gas Light and Coke Company, Distribution Superintendent.
Bath, Jan. 9, 1924.

Salesmanship.

SIR,—The excellent lecture delivered recently by Mr. Goodenough at King's College on the "Fuel of the Future" contained many striking statements. Among them were the following:

> Out of every 100 heat units in the coal carbonized at gas-works of to-day, 50 are returned to the solid-fuel market as coke; 5 are recovered as tar; 22·5 are lost in manufacture and distribution; and 22·5 reach the consumer as gas. Hence, out of 100 heat units in the coal carbonized, 77·5 are delivered to the community, and only 22·5 are lost.
>
> In the gas-works of the future it is possible that coal will be as completely as possible gasified, and that 75 heat units out of every 100 in the coal treated will be available for distribution as gas.

Mr. Goodenough has been extremely cautious in his phrasing, but

even so he brings to the forefront a condition respecting to-day's gas-works practice which most people in the gas industry are doing their level best to keep in the background. If the present gas-works practice results in 77·5 p.ct. of the heat energy of the coal handled being delivered to the community, why look forward to complete gasification, by which only 75 p.ct. of the coal handled will be delivered to the community? Nobody can answer this question better than Mr. Goodenough.

Nuneaton, Jan. 11, 1924. GEO. HELPS.

"Pulverized Fuel."

SIR,—With reference to my paper "Pulverized Fuel and Efficient Steam Generation," extracts of which were published in the "JOURNAL" for Jan. 2, p. 34, I note that the statement continues to be industriously circulated that in this paper I have compared the regular running figures of Dalmarnock Station, Glasgow (mechanical stoking) with the short-test figures only of the Lakeside Station, Milwaukee (pulverized coal). As this is the grossest possible misstatement, I should be grateful if you would allow me the use of your correspondence columns to contradict it most emphatically, and to ask everyone interested to read the paper for themselves.

The very fact that complete and continuous records for month after month, including of course all stand-by, banking, and blow-down losses, have been taken with the "Lopulco" pulverized fuel plant at Lakeside, is the reason why the paper has been written; and the matter is explained very clearly in the paper itself—for example:

> As regards the figures obtained with pulverized fuel at Lakeside, the net results are 85 to 86 p.ct. actual working efficiency month in and month out. . . . These figures are based in the first place on a most elaborate series of special tests carried out under actual running conditions, probably unsurpassed for care and accuracy and for the time and trouble taken. Secondly, they are the results of continual weekly records taken as part of the routine of the station control. . . . In May and June, 1923, the weekly figures averaged 86 to 87 p.ct.

Of course, the figures for continuous running are of chief importance, but I have also included the results of a number of day tests at Lakeside. On one occasion 89·1 p.ct. efficiency was obtained, while I have given very elaborate figures for five tests varying from 19·92 to 42·33 hours' duration, in which the efficiencies varied from 84·6 to 89 p.ct. efficiency. During the last few days I learn that 91·3 p.ct. has been obtained on one test. Accordingly, therefore, in the comparison I have assumed 86 p.ct. for pulverized coal (the continuous figures) since in the more recent stations the guarantee figures alone are as high as 88 p.ct.

As regards Dalmarnock I give the figures for 52 consecutive weeks (1922-23), showing 76·6 p.ct. boiler-plant efficiency; while for day trials I give the results of a typical short test (one day, Sept. 21, 1923), the efficiency figures being 78·4 p.ct., and those of two very short snap tests of 6 hours and 3 hours, giving 81·92 p.ct. and 83·56 p.ct. efficiency respectively.

In order, however, to give every possible advantage to mechanical stoking, I have assumed that Dalmarnock might be run at 81¼ p.ct., though there is not a mechanical stoker station on earth that has ever run continuously at this figure. I would ask, as already stated, those interested to read the paper themselves, and I can assure a number of people that the progress of pulverized fuel is not going to be delayed by misrepresentations of this character.

46, Grange Road, Ealing, London, W. 5, Jan. 13, 1924. DAVID BROWNLIE.

"Japan's Purgatory."

[Reprinted from "The Arc"]

SIR,—I have read with considerable surprise the paragraph entitled "Japan's Purgatory," by Mr. J. E. Robinson, in your October issue. The statements made therein and the policy advocated are so extravagant as to call for a protest, though, from their very extravagance, your contributor's remarks on this subject cannot carry weight with any reasonable individual.

Even admitting that the fires which followed the disastrous earthquake were aggravated in some instances by the presence of gas, is it not true that there were many deaths by electric shock? Also, in a disaster of such magnitude, was the death-roll affected appreciably by either of these indispensable adjuncts of civilization? Undoubtedly many imprisoned victims were drowned by burst water-pipes. Would Mr. Robinson recommend the abolition of water supply? Most of the fatalities were caused by falling buildings. Why not refrain, therefore, from erecting such menaces to life and limb?

With the single exception of this unfortunate contribution, I have the highest admiration for the interest and utility of "The Arc;" and I feel confident that you would wish to dissociate yourself from the biased views of your contributor, which, frankly, are less than fair to an important section of the community.

Manchester. "FAIRPLAY."

[We need hardly say that we do not necessarily endorse the opinions or policies expressed by any of our contributors, and in this instance we agree with "Fairplay"—and with our esteemed contemporary "The Gas Journal" which has also taken up the matter—that Mr. Robinson's position is untenable. Both the gas industry and the electrical industry are essential to every civilized community.—ED.]

SIR,—The castigation by your correspondent "Fairplay," though severe, is administered so courteously that I cannot and do not take offence. There are many applications wherein electricity can be used to advantage in preference to gas. But I admit that it would be impracticable to dispense with gas; and I regret any unpleasantness which my words may have occasioned.

London. J. E. ROBINSON.

REGISTER OF PATENTS.

Cooling Coke.—No. 192,706.

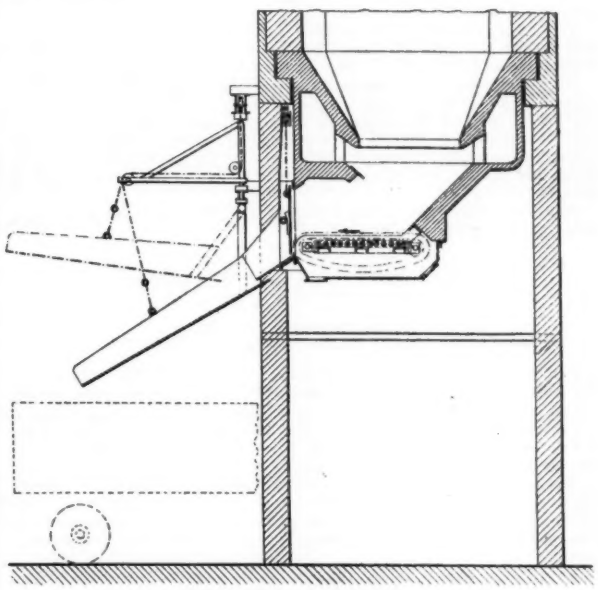
SULZER FRÈRES STÉ. ANYE., of Winterthur.

No. 3156; Feb. 2, 1923.

(Patent of Addition to No. 173,762 of Jan. 3, 1921.)

Convention Date: Feb. 2, 1922.

This invention relates to a modification of the apparatus for cooling incandescent coke claimed in patent No. 173,762 [see "JOURNAL" for May 23 last, p. 487]. The object of this invention is to provide improved means for discharging the coke from the cooling chamber of such apparatus which, as in the main patent above referred to, comprises a discharge hopper at its lower end having an inner coaxial hopper within the chamber.



Discharging Cooled Coke.

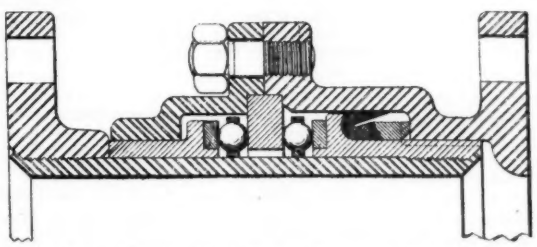
In the illustration which we reproduce, may be seen the two coaxial hoppers, having an annular chamber between them into which the cooling gases are delivered in an upward direction to the coke within the container. Immediately below the open end of the discharge hopper is provided a conveyor belt running on wheels and rollers, and driven in the direction of the arrow by one of the wheels. This lower hopper is provided with a lateral opening so that when the conveyor is set in motion the coke which continually falls through the discharge opening from the container is conveyed to a shoot. The opening is normally closed by a sliding or other door, and the conveyor is partially enclosed within a gas-tight casing so that the flow of cooling gases is in no way interfered with from outside.

Rotatable Pipe-Joints.—No. 207,999.

DORMAN, W. H., & Co., LTD., and STEED, O. H. G., both of Stafford.

No. 39,419; Nov. 27, 1922.

This invention relates to rotatable pipe joints of the spigot-and-socket type provided in the socket with a thrust ball bearing and packing on the pressure side of the ball bearing. The object is to provide a joint having increased freedom of resistance to the relative rotation of the two pipes.



Rotatable Pipe-Joint—Messrs. Dorman & Co., Ltd.

A section through the joint is clearly shown in the accompanying illustration; the patentees remarking that the joint is characterized "by the thrust flange being detachably secured in the socket of a spigot-and-socket joint having fluid-tight packing in the socket. The fluid-tight packing is preferably U-shaped and arranged between the spigot and socket on the fluid side of the ball bearings. The socket member may be constructed of two detachable portions arranged to secure the ball bearing flange between them."

Prepayment Mechanism.—No. 208,033.

M'INTYRE, J., and MILNE, J., & SON, LTD., both of Edinburgh.

No. 839; Jan. 10, 1923.

(Patent of addition to No. 205,596 of July 27, 1922.)

This patent of addition to No. 205,596 has for its object to improve the construction of the apparatus and make it more secure and accurate in operation.

With the view of simplifying the construction of the coin holder, to which a toothed actuating wheel is attached, the coin-holder is formed by cutting slots in three discs or rings which are bolted together and mounted on a spindle in such a manner that the slots are in alignment. The large toothed wheel (which may be a complete or part wheel) is attached to the outer disc. The coin slot is cut in a plate situated on the top of the attachment. Under the slot there is a flap door fixed in such a manner that when the coin holder is rotated by operating the handle in a clockwise direction, the middle disc which forms the coin-holder comes into contact with the flap door, causing it to lift and close the coin-slot and to keep it closed until the coin-holder is brought back to receive another coin.

The combination of a keep-plate and stationary cam prevents the coin-holder and toothed wheel from being moved forward in a lateral direction into gear until the coin strikes the start of the stationary cam.

The actuating wheel, when moved forward, gears with a smaller wheel. The latter is normally locked by a toothed plate, which is moved forward by the actuating wheel, releasing the smaller wheel; the throwing out of gear of the wheels again locking the smaller one. Provision is made to prevent the insertion of more coins than the indicating mechanism allows, and for the locking of the price-changing disc.

Readers are referred to the complete specifications concerned, and their respective illustrations.

Gas-Cookers.—No. 208,191.

HELPS, G., of Nuneaton.

No. 21,763; Aug. 10, 1922.
No. 27,516; Oct. 11, 1922.

The patentee claims: In a gas cooker, the combination, with a burner adapted to burn without secondary air, of an oven normally closed except for the space required for the issue of the gaseous mixture into the oven; a self-contained burner unit, adapted to be fitted into, and close, a space left for it in the base or wall of the oven; the arrangement that the burners are flanged and fit into recesses formed in the base or a wall of the oven; the combination, with a burner adapted to burn without secondary air, of an oven into which air normally enters through the burner only, a second oven, and means for leading the products of combustion from the first into the second oven.

Rotary Scrubbers.—No. 208,328.

HOLMES, W. C., & Co., Ltd., HENSHAW, D. M., and WHITTLE, J., all of Huddersfield.

No. 30,346; Nov. 7, 1922.

This invention relates particularly to rotary gas washers or scrubbers in which a number of brush or other devices are arranged upon a rotating member and revolve within a cylindrical chamber containing liquid into which the brushes dip as they rotate. The object of the invention is to provide that the driving means and gearing may be entirely enclosed and protected, so that a very neat and compact self-contained unit is produced.

The patentees point out that on a works a washer must be located close to, and in correct sequence with, other apparatus, and as a consequence the source of power and gearing are working, as a rule, under very unfavourable conditions—exposed to the weather and to acid and other vapours, so that they are liable to deteriorate rapidly.

The invention consists essentially in housing an engine or motor for driving the shaft of the washer or scrubber, together with the gearing connecting it, within an extension of the cylinder which forms the body of the washer. The extension is divided off by a partition through which the driving shaft for the rotor passes in a substantially gas and liquid tight bearing. The outer end of the cylinder extension is entirely closed by hinged or sliding door portions, so that the engine and motor are completely enclosed and protected, but access to these may readily be obtained.

The specification describes and illustrates the apparatus as comprising a small horizontal steam engine; a feature being that the bedplate supports coincide with the main scrubber supports, with the shell plate intervening—the minimum weight thus being borne by the extension.

Feeding Fuel into Gas-Retort Furnaces. No. 208,429.

WILLIAMS, A. E.

No. 3815; Feb. 8, 1923.

This invention has reference to apparatus for feeding coke or other fuel into the furnaces of gas-retort settings and the like. Such apparatus, as at present constructed, consists essentially of a shoot, which catches the coke as it is pushed out of the retorts, and a reciprocating poker bar which pushes the coke from the shoot into the furnace; the whole being carried on a suitable frame provided with means for travelling along the retort-house.

The patentee says that it has been proposed to provide means for imparting motion to the poker bar by which the velocity of the latter is caused to vary from a maximum at the middle of the stroke to zero at the ends, thereby minimizing shock of impact—*e.g.*, by means of a power unit (such as an electric motor) actuating, through suitable gearing, a cross-head, the reciprocatory motion of which is transmitted to the poker bar. The present invention has for its object to allow for an automatic variation of the length of stroke of the poker bar according to the resistance it encounters as the producer fills up, without altering or affecting the driving elements.

The poker is of tee iron or other suitable section, guided by rollers and carried by a slipper working on a guide-bar. Reciprocation of the poker is obtained from a gear-driven cross-head and a wire rope over pulleys; and the variable stroke is effected by means of a friction brake device.

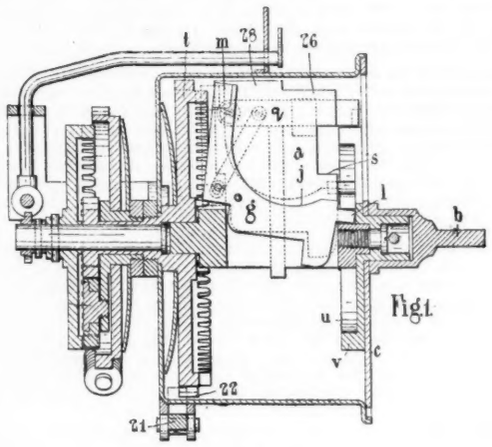
Prepayment Mechanism.—No. 208,181.

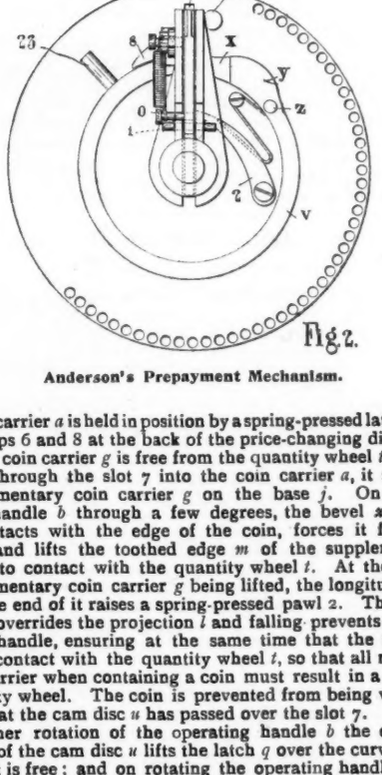
ANDERSON, J., of Edinburgh.

No. 18,600; July 6, 1922.

This invention seeks to provide an improved form of prepayment mechanism, which may be combined with the systems of measuring out, &c., described in patents Nos. 183,157 [see "JOURNAL" for Aug. 30, 1922, p. 478], 205,162 [see Nov. 14, 1923, p. 458], and 206,553 [see "JOURNAL," Dec. 26, 1923, p. 841].

Fig. 1 is a sectional elevation through the mechanism, and fig. 2 an elevation of the price-changing disc, &c., looking towards the front of the meter. The operation is as follows.





Anderson's Prepayment Mechanism.

The coin carrier *a* is held in position by a spring-pressed latch *q* between the two stops 6 and 8 at the back of the price-changing disc *c*. A supplementary coin carrier *g* is free from the quantity wheel *t*. On inserting a coin through the slot 7 into the coin carrier *a*, it seats itself in the supplementary coin carrier *g* on the base *j*. On rotating the operating handle *b* through a few degrees, the bevel *x* on the cam ring *v* contacts with the edge of the coin, forces it forwards and upwards, and lifts the toothed edge *m* of the supplementary coin carrier *g* into contact with the quantity wheel *t*. At the same time, the supplementary coin carrier *g* being lifted, the longitudinal projection *l* at the end of it raises a spring-pressed pawl 2. This almost immediately overrides the projection *l* and falling prevents return of the operating handle, ensuring at the same time that the tooth *m* must remain in contact with the quantity wheel *t*, so that all movements of the coin carrier when containing a coin must result in a movement of the quantity wheel. The coin is prevented from being withdrawn by the fact that the cam disc *u* has passed over the slot 7.

On further rotation of the operating handle *b* the cam *y* on the periphery of the cam disc *u* lifts the latch *q* over the curved projection 8 so that it is free; and on rotating the operating handle *b* through a further small angle, this rotation of the coin carrier *a* takes place by contact of the pin *z* with the face of the coin.

The operating handle *b*, cam disc *u*, coin and coin carrier *a*, together with the quantity wheel *t*, are now rotated together until the coin contacts with a stop placed at the edge of the exit for coins formed in the wall of the casing. This stop is so shaped that first the coin projecting from the part 26 of the coin carrier *a* contacts with a portion of the stop, and the coin falls. Then 28 contacts, and further forward rotation of the carrier is prevented. The cam disc *u* has a certain amount of additional free movement—namely, until a pin 23 radially

projecting from the cam ring *v* contacts with the stop 6 projecting from the back of the price-changing disc.

Further rotation of the operating handle *b* in the forward direction is ineffective from the point of view of measuring-out gas, because owing to release of the coin the driving pin *z* passes through the slot *s* formed in the front edges of the cheeks of the coin carrier.

On rotating the operating handle *b* in the backward direction, the coin carrier *a* is returned by action of the pin 1 to its normal position for receiving the coin. During this return movement the coin carrier *a* is free from the quantity wheel *t*, because when the coin falls into the coin box the spring on the coin carrier acts to withdraw the tooth *m* on the supplementary coin carrier *g* from contact with the teeth of the quantity wheel.

As the quantity wheel is moved in its forward direction, prepayment is made; but operation of the meter does not effect rotation of the quantity wheel in the reverse direction, this being prevented by the gravity controlled pawl 21, which engages ratchet teeth 22 formed on the rim of the quantity wheel.

Dry Gas-Meters.—No. 208,467.

MARKS, E. C. R., of Lincoln's Inn Fields, W.C. 2 (a communication from Herbert Griffiths, of Wellington, N.Z.).

No. 9687; April 9, 1923.

The object of this invention is to effect certain structural improvements in dry gas-meters, whereby the meter can be readily taken to pieces for inspection and repairs, and readily assembled again.

The meter, of the diaphragm type, is characterized in that the valve plate is removably seated on a circular casing; gas-tight communication being effected therewith by means of projecting flanged pipes.

A further feature consists in that the flexible diaphragms constituting part of the measuring compartments are secured to flanged rings projecting from the dividing wall of the circular casing by means of clamping rings with bolts and nuts.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Jan. 9.]

Nos. 1 to 388.

ALLEN-LIVERSIDGE, LTD.—"Filling receptacles with porous, &c., material for storing gases under pressure." No. 241.
ALLEN-LIVERSIDGE, LTD.—"Gas-pressure regulators, &c." No. 289.
APTHORPE, W. H.—"Pyrometers." No. 63
CALLAGHAN, J. A.—"Gas-cookers." No. 133.
CAMBRIDGE AND PAUL INSTRUMENT COMPANY, LTD.—See Apthorpe, W. H. No. 63.
CARPENTER, C.—"Gas-cookers." No. 325.
COBB. J. W.—"Purification of gas." No. 308.
COLEY, H. E.—"Manufacture of thorium, cerium, &c." No. 86.
EVANS, E. V.—"Preparatory treatment of coals." No. 294.
FOSTER, C. E.—"Automatic control valve." No. 52.
HODSMAN, H. J.—See Cobb, J. W. No. 308.
LAWES, W. H.—See Apthorpe, W. H. No. 63.
LEECH, W. B.—"Hydraulic gas-mains." No. 106.
NORFOLK, T. L.—"Apparatus for discharging coal from tipping-wagons, &c." No. 355.
ROBERTS, J.—"Carbonization of coal." No. 119.
ROSEWARNE, T. V.—"Portable gas heating and cooking apparatus." No. 176.
SHANNON, J.—"Atmospheric gas-burners." No. 16.
STÉ. L'AIR LIQUIDE. STÉ. ANYE. POUR L'ETUDE ET L'EXPLOITATION DES PROCÉDÉS G. CLAUDE.—"Purification of gas." No. 40.
SOUTH METROPOLITAN GAS COMPANY.—See Evans, E. V. No. 294.
SOUTH METROPOLITAN GAS COMPANY.—See Carpenter, C. No. 325.
STEPHENSON, A.—See Allen-Liversidge, Ltd. No. 241.
TIPPER, E. O.—See Leech, W. B. No. 106.
WOODALL, DUCKHAM, AND JONES (1920), LTD.—See Evans, E. V. No. 294.
WOODHEAD, H. E.—"Gas pressure regulators, &c." No. 289.

Hayle Gas Company, Ltd.—At the annual meeting of the Company, Mr. F. Hamel Harvey (who presided) said he was pleased that they were again able to present a favourable report. The adoption of the accounts was agreed to, and a dividend of 5½ p.ct. was declared.

Manchester Justices' Meter-Testing Committee.—At a meeting of the Manchester City Justices Gas-Meter Testing Committee on the 9th inst., Mr. H. N. Barrow was re-elected Chairman, and Mr. Harold King Deputy-Chairman. The other members on the Committee are Messrs. H. Boddington, F. Gregson, W. H. Hesketh, Hans Renold, and W. L. Burgess (new member).

Coke Prices at Barrow.—There was considerable discussion at the Barrow Town Council meeting on Monday of last week regarding the Gas Committee's recommendation that there should be an adherence to the charge of an extra 1s. per ton for coke loaded into carts with a fork—making the price 31s. per ton. The Barrow Master Bakers' Association had had an interview with the Committee, and had stated that they had been allowed to use a fork for a number of years. Mr. Brennan made the observation that the price for coke was 20 p.ct. above that of any other town within a hundred miles, but Alderman Whinnerah (the Chairman of the Committee) declared that Barrow was selling coke cheaper than any other coke-producing plant in the district. The Committee, he said, felt that they had to establish a general principle, and that anyone using a fork must pay for it. Other speakers contended that if certain people could use a fork without extra payment there would only be breeze left for domestic consumers. The Council supported the Committee by 24 votes to 5.

MISCELLANEOUS NEWS.

GAS REGULATION ACT APPLICATIONS.

The following further notice has appeared in the "London Gazette" with regard to the Gas Regulation Act.

DECLARATION OF CALORIFIC VALUE.

West Bromwich Corporation.—450 B.Th.U. (April 1.)

GAS REGULATION ACT ORDERS.

From the Director of Gas Administration we have received a copy of the following further Order made by the Board of Trade under section 1 of the Gas Regulation Act.

AMENDING ORDER.

Newcastle-upon-Tyne and Gateshead Gas Company.

(On the application of the Newcastle-upon-Tyne Corporation.)

As from Dec. 22, 1923, section 3 of the Newcastle-upon-Tyne and Gateshead Gas (Charges) Order, 1921, shall be read and have effect as if the word "eleven" were substituted for the words "fourteen and two-fifths" therein; and section 5 of that Order shall be read and have effect as if the words "twelve decimal four" were substituted for the words "fifteen and four-fifths," and the word "fourteen" were substituted for the words "seventeen and two-fifths" therein.

NANTWICH GAS-WORKS INQUIRY.

Reconstruction and Extension Programme.

Mr. A. W. BRIGHTMORE, one of H.M. Inspectors, last week inquired into the application of the Nantwich Urban Council for sanction to borrow £13,000 for carrying out items of reconstruction and extension of the gas-works.

Mr. A. E. WHITTINGHAM (Clerk to the Council) submitted statistics relating to the district, and said that the Council acquired the gas undertaking under the provisions of their Act of 1903. The price was ascertained by arbitration; the amount of the award being £68,148.

Mr. H. VERNON (Gas Manager) said that the output of gas at that time was 30 million c.ft. per annum.

The INSPECTOR asked if there was any special reason why such a high price should have been paid.

The CLERK replied that they were somewhat unfortunate. The Council had estimated that they would not have to pay more than £50,000. Considerable building developments were going on at Wistaston and Stapeley, in the area of supply; and there were prospects of large works being erected which would probably bring about an increased demand.

Mr. VERNON remarked that at the time of his appointment in August, 1918, the old retort-house was in a dilapidated condition, showing signs of collapse; and two beds of retorts had become unfit for further use. In March, 1920, he was instructed to prepare a provisional estimate of the cost of certain work of reconstruction and extension, which could not be carried out in its entirety, owing to the prohibitive cost. However, in 1923, he prepared a scheme which was subsequently approved by Mr. J. H. Brearley, the Council's Consulting Engineer, and the Council themselves, which was estimated to cost £13,850. It was proposed to pay the £850 out of revenue. For the nine months ended Dec. 31, 1923, the gas sent out showed an increase of 2,324,000 c.ft., or 5·4 p.ct. on the corresponding period of the previous year.

Mr. H. KNOWLES announced that the Chairman of the Gas Committee was unavoidably absent; but, as a member of the Council, he would like to explain the position in which the Council were placed. They were confronted with an expenditure of £6000 for replacing buildings which were tumbling down, and continuing the obsolete system of carbonization. For an additional £7000, they would be able to instal a new plant; and they thought this would be an opportune time to bring their works up-to-date.

This concluded the inquiry, and the Inspector visited the works.

Lyme Regis Gas Price Increased.—The Lyme Regis Gas Company, who have been charging 8s. per 1000 c.ft. for gas, have issued a circular to consumers stating that, owing to the high cost of coal and the small consumption of gas, they are compelled to raise the price to 10s. per 1000 c.ft

Primitiva Gas Reorganization.—There are to be meetings at River Plate House next Tuesday of the various classes of shareholders in the Primitiva Gas Company of Buenos Aires, Ltd., to consider a scheme for the reorganization of the capital, rendered necessary by trading losses and depreciation of assets. According to the resolutions to be submitted, the capital of the Company is to be reduced from £4,000,000 to £2,339,644 by cancelling £1 per share on the £5 preference shares, leaving them £4 fully paid, and writing off £4 per share on the £5 ordinary shares, making them £1 fully paid. The preference shares will then be subdivided into four shares of £1 each, and the unissued 9911 ordinary shares of £5 will also be subdivided into £1 shares. Upon this reduction taking effect, the existing rights of the preference shares will be extinguished, and the whole of the preference and ordinary shares will be consolidated into one class, consisting of 2,339,644 ordinary shares of £1 each.

LEEDS UNIVERSITY LECTURES.

Department of Coal Gas and Fuel Industries with Metallurgy.

PROGRAMME OF SPECIAL COURSES FOR SESSION 1923-24.

In connection with the work of the department, arrangements have been made for the delivery, during the second term of the session, of the following special courses of evening lectures.

I.—THE MANUFACTURE OF COAL GAS.

Mr. RHEAD and Mr. HOLLINGS.

A course of twelve lectures divided into two sections, A and B, will be given on Fridays during the second term.

A—CARBONIZATION PRACTICE.

This section will be given by Mr. T. F. E. Rhead, M.Sc., A.I.C., Chief Chemist, City of Birmingham Gas Department. It will consist of six lectures—at 6 p.m. and 7.30 p.m. on Friday, Jan. 18, Jan. 25, and Feb. 1.

SYLLABUS.

The carbonization and gasification of coal for town gas; manufacture in different settings of horizontal, inclined, intermittent, and continuous vertical retorts, coke-ovens, water-gas, and complete gasification plant. Construction of settings and retort-bench ironwork. Method of heating and controlling settings. Comparison of results; thermal and economic efficiencies. Fundamental factors affecting processes and design of plant. Factors affecting quantity and composition of crude gas. Laboratory and large-scale testing of coals for gas manufacture, &c. Effect of recent legislation on gas manufacture.

B.—GAS PURIFICATION PRACTICE.

This section will be given by Mr. H. Hollings, M.Sc., A.I.C., Senior Gas Chemist, South Metropolitan Gas Company, London. It will consist of six lectures—at 6 p.m. and 7.30 p.m. on Friday, Feb. 15, Feb. 22, and Feb. 29.

SYLLABUS.

Nature of the impurities in crude coal gas, and the factors affecting their formation. General outline of purification processes. The general processes of cooling and condensation. The function, design, and operation of air and water cooled condensers, tar-fog extractors, &c. The electrical precipitation of tar. The general principles of ammonia extraction. The constitution of ammoniacal liquor. The design and operation of washers and scrubbers. The direct recovery of ammonia. The simultaneous removal of ammonia and hydrogen sulphide. The removal of cyanogen. The oxide-of-iron process for the removal of hydrogen sulphide. Factors determining the choice of an oxide of iron. The preparation of oxides. The design of oxide-of-iron purifiers. Processes for the removal of carbon bisulphide and naphthalene. The avoidance of naphthalene deposits. The contamination of gas on storage.

Fee for the course—Sections A and B, £1 1s. Fee for either section taken separately, 15s.

IX.—AERATION OF GAS BURNERS.

Mr. WOOD.

Two lectures will be given by Mr. J. W. Wood, M.Sc., A.I.C., Research Chemist to the Joint Research Committee of the Institution of Gas Engineers and the University of Leeds, at 6 p.m. and 7.30 p.m. on Friday, March 7.

SYLLABUS.

These lectures will deal with the principles of air injection, and their application to practice in the construction and working of burners used for heating and lighting.

Fee for the two lectures, 5s.

II.—REFRACTORY MATERIALS.

Prof. COBB.

A course of eight lectures will be given by Prof. J. W. Cobb, C.B.E., B.Sc., F.I.C., of Leeds University, on Tuesdays, at 6 p.m. and 7.30 p.m., commencing Jan. 15, and concluding Feb. 5, 1924.

SYLLABUS.

Physical and chemical principles on which the manufacture and use of refractory materials are based. Consideration of raw materials available and manufacturing processes. Choice of refractory materials for use in furnaces of different types Method of testing.

Fee for the course, 15s.

IIa.—PHYSICAL PROPERTIES OF REFRACTORY MATERIALS.

Mr. HOULDSWORTH.

A course of four lectures will be given by Mr. H. S. Houldsworth, M.Sc., Research Assistant and Assistant Lecturer on Refractory Materials in the University of Leeds, at 6 p.m. and 7.30 p.m. on Tuesday, Feb. 12 and Feb. 19.

SYLLABUS.

The lectures will deal with the physical properties of silica, fireclay, magnesia, and other refractory materials in more detail.

Fee for the course, 10s.

III.—METALLURGY.

Mr. SUMMERS.

A course of six lectures on the microscopic study of engineering alloys, followed by practical work in the laboratory, will be given by Mr. P. F. Summers, A.R.S.M., on Wednesdays, at 6 p.m., commencing Jan. 23, 1924, and concluding Feb. 27. The course will be divided into two parts, which may be taken separately.

PART 1. GENERAL (three lectures, with laboratory work):

An introduction to the metallographic study of metals and alloys, their preparation and examination. The composition and uses of various engineering alloys.

PART 2. SPECIAL (three lectures, with laboratory work):

The microstructure and other properties of tool steels.

Fee for each part (including laboratory work), 7s. 6d.

IV.—EVENING LABORATORY COURSE.

Prof. COBB, Mr. HODSMAN, and Mr. SUMMERS.

The laboratory of the department will be open on Wednesday evenings between 6 p.m. and 9 p.m. from Jan. 23 to Feb. 27, for a limited number of students who have already received some chemical training, but who desire instruction in Fuel Calorimetry and Pyrometry. More advanced students, capable of independent work, may also be admitted to the laboratory during these periods.

Fee, 10s. 6d. The earliest possible application from intending students is requested.

V.—DAY LECTURE COURSES.

For information respecting the Day Lecture Courses in the Coal Gas and Fuel Industries Department of the University—namely, in properties of gases, technology of fuel, general and non-ferrous metallurgy, iron and steel, and alloys and metallography—see the special prospectus of the department, obtainable on application to the Registrar.

VI.—ADMISSION OF STUDENTS, INQUIRIES, &c.

Intending students are requested to send in their names without delay to the Registrar of the University, specifying at the same time what course or courses they wish to attend. Other inquiries regarding the courses should be addressed to Prof. Cobb, the Head of the Department of Coal Gas and Fuel Industries (with Metallurgy). The University reserve the right to decide that any course shall not be given, if the number of entries is inadequate. In view of the demands on the University accommodation, the earliest possible application for admission to the day courses, commencing October, 1924, is advisable.

TREDEGAR'S GROWING GAS OUTPUT.

Suggestions for Meeting the Situation.

Of reports presented to the Tredegar Urban District Council one of the most important for a very long time was submitted on Tuesday of last week by the Gas and Water Manager (Mr. D. W. Davies), who stated that the gas make for December was 8,270,500 c.ft., or an increase of 676,000 c.ft. over the same month in the previous year. These figures were the highest recorded by the undertaking. The biggest hourly make during the past month was 13,100 c.ft. With these figures in mind, it was interesting to note the capacities of the various parts of the plant, as follows:

	C.Ft. per Hour.
Retort settings (provided all retorts are in excellent working condition at the same time—a state it is not always possible to maintain)	14,000
Water-gas plant	2,000
Total producing plant	16,000
Condensers	10,000
Exhauster (the steam boiler in connection with this was installed in 1886)	15,000
Exhauster (gas-driven, as stand-by in case of breakdown)	10,000
Washer	10,000
Scrubber (new scrubbing plant was sanctioned by the Local Government Board in 1914, but the war intervened, and the work was not proceeded with)	5,000
Purifiers	10,000
Station meter	10,000

The gasholders are of a total capacity of 315,000 c.ft., and this, being slightly more than the maximum day's consumption, is sufficient for the time being.

Mr. Davies went on to point out that portions of the plant were totally inadequate to meet even the present demand, and no unit was of sufficient capacity to cope with any big increase in consumption. He recommended the Council to go into the whole question of making further provision, and for their guidance indicated three courses that were open. The first was to extend and improve the present works; but there was a limit to this, as the space at disposal would not be sufficient for any big development. Another was to obtain a supply of coke-oven gas from the mains of the Rhymney Gas Company. There was an abundant supply available, and gas from that source would be used to supply Rhymney and other places; the quality being good. The third alternative was to provide a supply of electricity.

It was agreed that a Committee should go into the question, and report fully on the Manager's suggestions to the Council.

At a later stage, Mr. E. R. Edwards raised the question of leakage, and said he understood it totalled about 25 p.ct. of the make. If this were so, it was a serious problem, and thorough consideration should be given to it. Mr. S. Filer agreed, and pointed out that it was estimated that a reduction of 10 p.ct. in the leakage would mean a saving to the town of £12 10s. a week. This in itself was sufficient reason for giving the subject close investigation. This matter also was referred to the Committee for a report.

The Bathroom Fatality at Nottingham.—There was reported on p. 100 of last week's "JOURNAL" an inquest on the body of a man who was found dead on a chair close to the gas heated apparatus in a small bathroom. It should be pointed out that the apparatus in question was a water heater, and not an ordinary form of geyser; and it has since been ascertained that there was no means of ventilating the burner underneath the heater, seeing that the flue-pipe was corroded away for a length of from 18 in. to 2 ft.

UNEMPLOYMENT GRANTS COMMITTEE.

Assistance to Companies Undertaking Works of Public Utility.

Under date of the 14th inst., an official announcement regarding the above subject has been issued by the Unemployment Grants Committee from No. 23, Buckingham Gate, S.W.

Certain modifications have been made in the terms on which State assistance may be given by the Unemployment Grants Committee to Public Utility Companies putting in hand works which would not at present be undertaken but for the need for relieving unemployment. The original terms of assistance were published in full in the public press in October last.

The principal alteration is in clause (5), which now reads as follows:

(5) Assistance will be limited to a maximum of 50 p.ct. of interest at an approved rate on the expenditure, as and when incurred, whether out of capital raised for the purpose or out of existing funds or out of current revenue. Grant will be made for a period of years which will be dependent mainly on the extent to which the work is being accelerated, and the date at which the works when completed are likely to be reasonably remunerative.

In cases where the period of assistance does not exceed seven years, the Committee may at their discretion commute, if so desired, the annual interest payments by a single lump-sum grant representing the present value of the whole of the interest payments.

It has been arranged with the banks that the regulations and requirements under which assistance may be obtained shall be available at their different branches.

Teignmouth Gas Regulation Act Order.—Mr. H. Hickmott presided at a meeting of the Teignmouth Urban Council, when a letter was read from the Board of Trade, with reference to the Council's application for an Order under the Gas Regulation Act, enclosing a draft of an Order which they proposed to make fixing a new maximum price for gas at 15·6d. per therm. It was decided to make further application to the Board for the inclusion in the Order of a clause providing for extra charges to be made for gas supplied through prepayment meters, and that otherwise the draft Order be approved.

Sheffield Street Lighting.—On a motion coming before the Sheffield City Council "That the Watch Committee be instructed, in preparing their estimates for the ensuing year, to include such an amount as will enable the whole of the street lamps in the city to be lighted," Alderman Cattell suggested that it was out of order, for the Watch Committee had already made provision in the estimates. The matter then rested with the Finance Committee. The Lord Mayor said the resolution was out of order; but when the question came up on the estimates, the Council could discuss it, if members were not satisfied.

THE NORTH-EAST COAST COAL TRADE.

From our Own Correspondent.

After rather a shaky opening, the week closed on a market generally firm. Ice was blamed chiefly for the weak beginning—ice in the inland waterways of Holland, ice in the Baltic, causing suspension of shipments there. The Seine floods have interfered very considerably with French shipments, but probably still more the continued adverse movements in the franc exchange. Belgium reports being flooded with cheap Ruhr coal.

Altogether it was not surprising that merchants holding coal should have been anxious to press some on the market. Good coking was to be had at 23s. 6d. to 24s.—a considerable drop. The recovery was perhaps due to the strong position in which collieries were found to be, with ample tonnage available, and books full well ahead.

Throughout the week, gas coals remained firm. The cold weather has maintained a good demand for full supplies for home consumption, and this section was not influenced by any of the export difficulties. Colliery quotations are firm at 25s. f.o.b. for Wear Specials, and 24s. 6d. to 25s. for best qualities, with seconds at 23s. to 23s. 6d.

The ballot of the Miners' Federation on the question of terminating the agreement should have no immediate influence on the market, as the result was generally accepted as a foregone conclusion. A steady demand, however, for gas and coking coal, and steams for London and coaling stations may be anticipated, while the situation remains unsettled.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From a Local Correspondent.

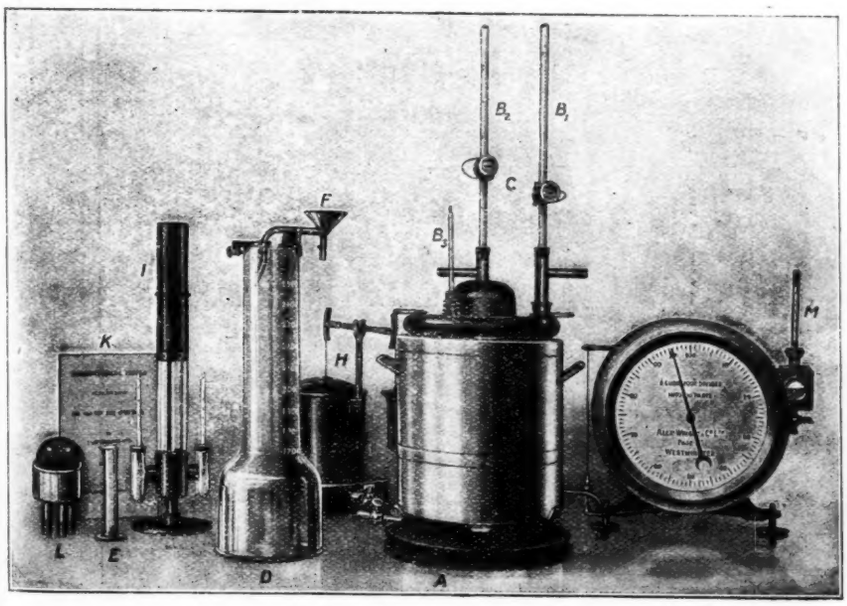
There is a strong demand for gas coal from Yorkshire and Lancashire, as most of the gas companies do not appear to have accumulated any large stocks during the summer months. They are now pressing for deliveries, with the result that it is somewhat difficult to meet their full requirements. This is having the effect of keeping prices firm for all qualities of gas coals.

All the collieries are inundated with orders for house coal, and prices have advanced for prompt supplies, more especially from the London area.

There is also a much better demand for industrial coals, particularly owing to the loss of output of the collieries during the recent holidays. Generally speaking, all classes of coal are mostly in good demand. In the export section, while prompt supplies are in fair request, there is not much business moving for forward delivery.

In Lancashire, less competition from Yorkshire and Derbyshire is noticeable; and Lancashire colliery prices are now comparatively low.

BOYS CALORIMETER



GAS REGULATION ACT, 1920.

CALORIMETER

as prescribed

by

GAS REFEREES.

ALEXANDER WRIGHT & Co., Ltd.,

1, WESTMINSTER PALACE GARDENS,

WESTMINSTER, S.W. 1.

COAL TRADE IN THE MIDLANDS.

From our Local Correspondent.

The tension in the Midlands has not been relieved. Snowstorms have interfered with the working of the pits, and transport has again been disorganized. Instead of arrears being overtaken, they have tended to increase. Plied with many more orders than they can fill, collieries have, in not a few cases, added one or two shillings to their prices. Steam coals are being so largely diverted from the household consumption that higher prices have to be paid for industrial supplies. Best house coals are now selling at 8s. above the summer level in some cases. In steams the difference is nearer 3s. Since the resumption of work in the various industries, buying has been renewed on a considerable scale. Slacks have been exceedingly firm. Nuts and beans have tended to appreciate. Having regard to the difficulties arising out of the holding-up of wagons on account of interrupted output, supplies of gas coal have been well maintained. Engineers view with uneasiness, however, the depletion of their stocks at a time when consumption is at the peak. Gas coke is almost unobtainable in any considerable quantities. The stringency in foundry coke is as severe as ever; blast furnacemen being quoted 27s. to 28s. at ovens.

Fittings and Appliances Inspector for Loughborough.

Complaints have been recently made in Loughborough as to the nature of the gas supply; but at the last meeting of the Council Mr. L James (the Chairman of the Gas Committee) declared that a considerable number of these grumbles were not legitimate, and that the criticism ought to be levelled against the consumers themselves for not properly looking after their fittings. It was therefore proposed to appoint an official to inspect the fittings and appliances in use by consumers. The appointment of an inspector would, it was hoped, tend to minimize complaints and help to encourage consumers generally to have new and up-to-date fittings. Mr. R. Spriggs, in seconding the adoption of the report, which was agreed to, said that if the members saw some of the repairs which had been done in houses they would realize that it was necessary, in the interests of the safety of the people, to take steps to remedy the present state of affairs. Mr. M'Ghie congratulated the Committee upon the progressive step they had determined to take in regard to the appointment of an inspector. He was convinced that, with a more efficient service, they would be able to get a larger number of customers, and, ultimately, reduce the charges.

Deal Gas Prices.—The Deal and Walmer Gas Company announce a further reduction in the price of gas used exclusively for power purposes. The reduction takes the form of a rebate of 10 p.ct. off the ordinary meter rates, and it applies to gas used after last December's meter readings.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Jan.* 14.

There is practically nothing new in the London tar products market. The value of pitch is still nominal, and will remain so probably until buyers come forward at a reasonable price. Meantime, makers are well occupied with orders in hand. Should there be a railway strike, as foreshadowed, coal supplies would probably be difficult to obtain, and this may react on prices of tar products. Creosote and other products are unchanged.

Tar Products in the Provinces.

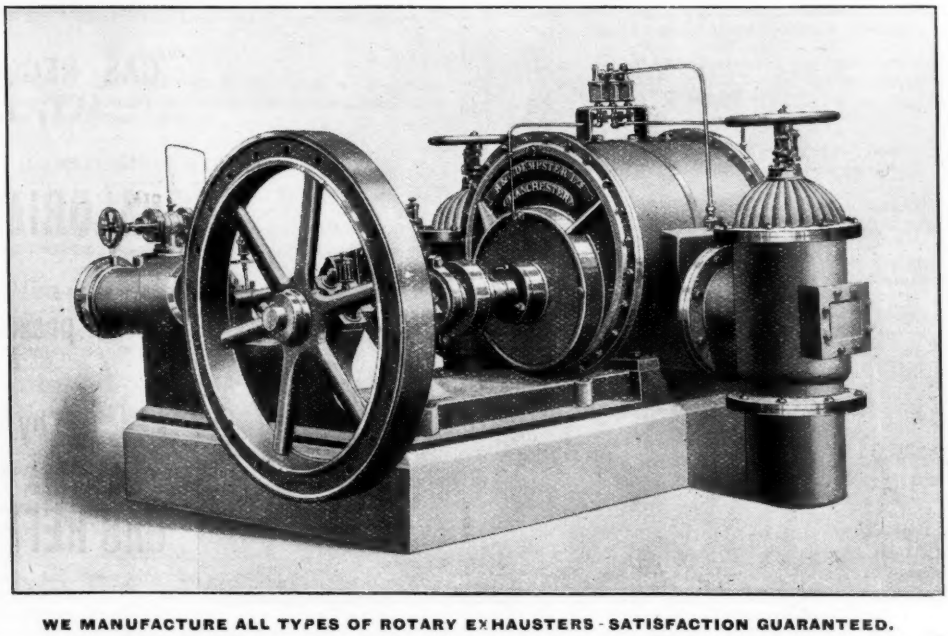
Jan. 14.

The market for tar products generally has remained quiet throughout the past week. Pitch still remains dull; and although there is a fair amount of inquiry, very little business appears to have been transacted. Prices remain nominally unchanged. Creosote oil continues firm, and there is a fair amount of inquiry from the States. Orders for refined tar are reported to be brisk and well up to average. Creosote salts and naphthalene are very depressed. Cresylic acid is barely maintaining its price; while carbolic is decidedly weaker, owing to the figures which are accepted for crystals.

The average values for gas-works products during last week were: Gas-works coal tar, 62s. 6d. to 67s. 6d. Pitch, East Coast, 87s. 6d. to 90s. f.o.b. West Coast—Manchester, 82s. 6d. to 85s.; Liverpool, 83s. 6d. to 86s.; Clyde, 84s. 6d. to 87s. Benzole 90 p.ct., North, 1s. 0½d. to 1s. 1d.; crude 65 p.ct. at 120° C., 9½d. to 10d. naked at makers' works; 50-90 p.ct., naked, North, 1s. 5d. to 1s. 7d. Toluole, naked, North, 1s. 5d. to 1s. 7d., nominal. Coal tar crude naphtha in bulk, North, 7½d. to 8d. Solvent naphtha, naked, North, 1s. 1d. to 1s. 2d. Heavy naphtha, North, 1s. 4d. to 1s. 6d. Creosote, in bulk, North, liquid, 8⅝d. to 9d.; salty, 8¼d. to 8⅜d.; Scotland, 8½d. to 8⅝d. Heavy oils, in bulk, North, 9d. to 9½d. Carbolic acid, 60 p.ct., 2s. 3d. to 2s. 6d. prompt. Naphthalene, £15 to £16; salts, £6 to £8, bags included. Anthracene, "A" quality, 4d. per minimum 40 p.ct., purely nominal; "B" unsaleable.

Plymouth Gas Company and Harbour Rates.—A Bill to increase the rates, dues, and charges leviable by the Sutton (Plymouth) Harbour Improvement Company has been deposited for introduction into Parliament. It is proposed to repeal any order that has been made by the Minister of Transport authorizing a temporary increase of charges, and to establish new schedules in substitution for those in force. It is proposed to exempt the Plymouth and Stonehouse Gas Company from the operation of the Act so long as they continue to be under obligation to land in the harbour all seaborne coal used by them at their Coxside works.

ROTARY EXHAUSTERS



WE MANUFACTURE ALL TYPES OF ROTARY EXHAUSTERS - SATISFACTION GUARANTEED.

R. & J. DEMPSTER, LTD., MANCHESTER.

LONDON OFFICE: 34, VICTORIA STREET, WESTMINSTER, S.W. 1.

STOCK MARKET REPORT.

OWING to the proximity of the meeting of Parliament and the fears of a Labour Administration, business on the Stock Exchange at the commencement of last week was depressed. There were few buyers, and dealers were not anxious to take stock. Gilt-edged securities declined as a result of heavy selling, chiefly on the part of French and Spanish holders, and quotations in other markets were accordingly affected. Later on in the week, however, a brighter tone prevailed; some firmness being displayed. The Oil Market took a distinct turn for the better, encouraged by a further rise in the price of American crude oil, and the report that the supply would not equal the demand. Argentine stocks were favourably affected by the excellent crops prospect and the improvement in the exchange.

There was considerable activity in the Gas Market, but prices were affected by the general depression. The reconstruction scheme prepared by the Directors of the Primitiva Gas Company appeared in the Press on Saturday, and will be submitted to the stockholders at meetings called for Jan. 22. It is proposed to write-off no less than £1,660,356 of the capital—a sum that covers accumulative trading losses, depreciation, and provision for the Retiro works amortization account. The scheme, of which this is but a brief outline, is a drastic one, but not more so than the situation calls for.

The following changes took place in gas quotations: Alliance and Dublin 4 p.ct. debenture fell 1, to 60-65 *ex* div.; Brentford "A" and "B" each fell 2, to 98-103; British "A" 3, to 115-120; Gas Light 3 p.ct. debenture dropped 1 point, to 57-60; Imperial Continental fell 2, to 136-141, and 3½ p.ct. debenture ½, to 74-77. Montevideo rose 2 points, to 50-55, and Primitiva 5 p.ct. preference advanced by 1/16, to 1⅛-1⅜. South Metropolitan preference fell 1, to 97-99 *ex* div., 3 p.ct. debenture 2, to 57 60 *ex* div., and 6½ p.ct. debenture 1, to 104-106.

The following transactions were recorded during the week: On Monday, Brighton and Hove 177, Cape Town and District 4½ p.ct. preference 6⅛, Commercial 3½ p.ct. 93, 3 p.ct. debenture 58, Compania de Habana 5 p.ct. Bonds 99⅛, 100 *ex* div., Continental Union 32½ 35, 7 p.ct. preference 79½, European 7½, Gas Light and Coke 90⅛, 90⅜, 90⅞, 91⅛, 3½ p.ct. maximum 62½, 4 p.ct. preference 78½, 80, Imperial Continental 141, Montevideo 49, Portsea Island "B" 107, 107½, South Metropolitan 92, 92⅜, 6½ p.ct. debenture 105½, Swansea 7 p.ct. preference 103, 6½ p.ct. debenture 103 *ex* div., Tottenham District "B" 101, Tuscan 5 p.ct. debentures 58, Wandsworth "B" 111. Supplementary prices, Malta and Mediterranean 2nd (7½ p.ct. preference) 88s. 9d., 90s. On Tuesday, British 118, 120, Gas Light and Coke 90½, 90⅛, 90⅜, 90⅞, 91½, 91⅜, 91⅛, 91⅜, 3½ p.ct. maximum 63, 4 p.ct. preference 78½, 3 p.ct. debenture 59, 59½, Imperial Continental 138, Liverpool 7 p.ct. preference 106, South Metropolitan 92, 92½, Tottenham "B" 101½. Supplementary prices, Colombo Gas and Water 7 p.ct. preference 10, Portsea Island 4 p.ct. debenture 72. On Wednesday, Alliance and Dublin 61, 61½, 62⅜, British 117, Commercial 4 p.ct. 92, 3½ p.ct. 92½, Continental Union 32, 32½, 33½, Gas Light and Coke 90⅛, 91½, 91⅛, 3½ p.ct. maximum 63, 63⅜, 4 p.ct. preference 77½, Imperial Continental 138, South Metropolitan 92, 92½, 92½, 93. Supplementary prices, Cheltenham 5 p.ct. maximum 71. On Thursday, Alliance and Dublin 64, Bombay 5 5/16, 5⅜, Commercial 3½ p.ct. 92, Croydon sliding-scale 103 9/16, Gas Light and Coke 90½, 90⅜, 90⅛, 91, 91¼, 91⅜, 91½, 4 p.ct. preference 79½, Primitiva 5s. 6d., 6s. 3d., 5 p.ct. preference 21s. 3d., 21s. 6d., 4 p.ct. (River Plate) debenture 55⅜, 56, South Metropolitan 92, 92⅜, 3 p.ct. debenture 58 *ex* div., 6½ p.ct. debenture 104, Swansea 7 p.ct. preference 102⅜, Tottenham "B" 101⅛. Supplementary prices, Barnet "A" 154⅜, 4 p.ct. debenture 73½. On Friday, Alliance and Dublin 64, Brentford "B" 99, British 117⅜, Croydon sliding-scale 104⅛, maximum dividend 85½, Gas Light and Coke 90⅜, 91, 91¼, 91⅜, 4 p.ct. preference 78, 3 p.ct. debenture 57, Imperial Continental 137, Malta and Mediterranean 73s. 9d., 75s., Montevideo 51, 53, Oriental 101, Primitiva 5s. 10½d., 5 p.ct. preference 23s. 6d., 24s., South Metropolitan 91½, 92, South Suburban 5 p.ct. 99½. Supplementary prices, Cheltenham 5 p.ct. maximum 72.

Conditions in Lombard Street on Friday indicated that the plethora of credit which had been available since the beginning of the year had come to an end. The greater part of the day's business was transacted at 2 p.ct., although 2½ p.ct. had to be paid in some cases. The rate secured for Treasury Bills—£3 4s. 9·62d. p.ct.—was higher than had been anticipated. The rise in the French Bank rate to 5½ p.ct. is presumably an attempt to stem the steady flow of capital which is reported to be leaving France.

Weakness in the French franc continued a prominent feature in the Foreign Exchange market. During the day, the rate touched 89 50, and closed finally at 89.45—a fall of 95 c. on the day. This is a new low record, and makes the franc worth less than 2⅜d. The Belgian franc was comparatively steady. The dollar sterling was fairly steady, but dropped slightly on the week.

The Bank rate is 4 p.ct., to which it was raised from 3 p.ct. on July 5. Bankers' deposit rates are 2 p.ct. Deposit rates at call and 2½ p.ct. at notice.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S TRANSACTIONS.

Issue.	Shares.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Divid. at Rate of	NAME.	Closing Prices, July 30, 1914.	Variation. Quotations, Jan. 11.	Variation. Lowest and Highest Prices of Transactions.
£			p.c.	% p.a.				
131,978	Stk.	Aug. 9	—	5	Aldershot 5 p.c. max. C.	..	72—77	...
227,992	,,	,,	4	4	Do. 4 p.c. Pref.	..	70—75	...
1,551,868	,,	Oct. 4	2½	5½	Alliance & Dublin Ord.	59—64	60—65	61—64
374,000	,,	Jan. 10	4	4	Do. 4 p.c. Deb.	76—79	60—65*	...
280,000	5	Oct. 18	7½	8	Bombay, Ltd.	5⅛—6⅛	5—5⅛	5 5/16—5⅜
100,000	10	Aug. 9	16	8½	Bournemouth Gas and Water: 5 p.c.	..	12⅛—13⅛	...
583,110	10	,,	7	7	Bournemouth Gas and Water: B 7 p.c. Pref.	15—15⅛	11½—12⅜	...
115,000	10	,,	6	6	Bournemouth Gas and Water: 6 p.c. Deb.	13⅛—14	11—12	...
162,025	—	Dec. 28	—	4	Brentford A Consolid.	..	75—80	...
992,045	Stk.	July 12	14	6 10/0	Do. B New	261—266	98—103	...
734,920	,,	,,	11	6½	Do. 5 p.c. Pref.	204—209	98—103	99
55,000	,,	,,	5	5	Do. 4 p.c. Deb.	109—111	90—95	...
221,400	,,	Dec. 13	4	4	Brighton & Hove Orig.	91—93	76—81	...
214,745	,,	Aug. 23	11	11½	Do. A Ord. Stk.	208—213	175—180	177
244,200	,,	,,	8	8½	Bristol 5 p.c. max.	154—159	127—132	...
1,287,500	Stk.	July 26	5	5	British A Ord.	..	93—95⅜	...
570,000	20	Oct. 4	12½	12	Do. B New	44—45	115—120	117—120
100,000	10	Dec. 28	—	7	Do. 7 p.c. Pref.	..	120—125	...
120,000	Stk.	,,	4	4	Do. 4 p.c. Deb. Stk.	88—90	73—78	...
100,000	10	,,	—	6	Cape Town & Dis., Ltd.	1½—2½	6½—7½	...
100,000	10	Oct. 31	—	4½	Do. 4½ p.c. Pref.	4—6	6—7	6½
150,000	Stk.	Dec. 28	4½	4½	Do. 4½ p.c. Deb. Stk.	70—75	73—78	...
237,860	,,	,,	—	7½	Cardiff 7½ p.c. Deb.	..	105—110	...
137,150	,,	Aug. 9	5	5	Chester 5 p.c. Ord.	108—110	85—90⅜	...
1,513,280	,,	July 26	5/9/4	6	Commercial 4 p.c. Stk.	106—108	92—97	92
360,000	,,	,,	5½	6	Do. 3½ p.c. do.	103—105	92—97	92—93
475,000	,,	Dec. 13	3	3	Do. 3 p.c. Deb. Stk.	69½—71½	58—61	58
800,000	,,	14 Jan. 15	4	—	Continental Union, Ltd.	76—79	32—37	32—35
200,000	,,	Dec. 13	7	7	Do. 7 p.c. Pref.	115—118	78—83	79½
660,000		Aug. 9	—	6½	Croydon sliding scale.	..	102—105	103 9/16—104½
284,975		,,	—	5	Do. max. div.	..	85—88	85½
492,370	Stk.	,,	6	4½	Derby Con. Stk.	123—125	107—110c	...
55,000	,,	—	4	4	Do. Deb. Stk.	102—104	74—76c	...
209,000	,,	—	—	5	East Hull 5 p.c. max.	..	..	...
1,002,180	10	July 12	10	5	European, Ltd.	17½—18	7½—8½	7½
16,546,120	Stk.	July 26	4/17/4	5½	Gas Light and Coke: 4 p.c. Ord.	98—102	90—93	90⅛—91⅜
2,600,000	,,	,,	3½	3½	Gas Light and Coke: 3½ p.c. max.	76—79	63—66	62⅛—63⅜
4,062,235	,,	,,	4	4	Gas Light and Coke: 4 p.c. Con. Pref.	96—99	77—80	77⅛—79⅛
4,761,930	,,	Dec. 13	3	3	Gas Light and Coke: 3 p.c. Con. Deb.	72½—74½	57—60	57—59⅛
130,000	,,	Dec. 11	10	10	Gas Light and Coke: 10 p.c. Bonds	—	..	...
42,000	—	—	—	7½	Gas Light and Coke: 7½ p.c. Ilford Deb.	..	..	...
83,500	,,	Sept. 19	5	6⅔	Hastings & St. L. 5 p.c.	..	93—98	...
258,740	,,	,,	3½	5⅜	Do. 5½ p.c.	87—89	78—83	...
70,000	10	Oct. 18	11	10	Hongkong & China, Ltd.	16½—16⅝	16—17	...
86,600	Stk.	Aug. 23	9	9½	Horsey 7 p.c.	..	144—149	...
1,976,000	,,	Nov. 15	9	5	Imperial Continental	150—160	136—141	137—141
401,400	,,	Aug. 9	3½	3½	Do. 3½ p.c. Deb. Red.	84—86	74—77	...
235,248	,,	,,	6½	6½	Lea Bridge Ord. 5 p.c.	119—121	95—100	...
4,127,240	,,	Aug. 23	10	5½	Liverpool 5 p.c. Ord.	—	87⅛—88½b	...
600,000	,,	Sept. 19	—	7	Liverpool 7 p.c. Pref.	..	104—107b	106
165,736	,,	Aug. 23	7/5/6	9	Maidstone 5 p.c.	..	125—130	...
63,480	,,	Dec. 28	—	—	Do. 3 p.c. Deb.	—	54—59	...
75,000	5	Dec. 13	6	5	Malta & Mediterranean Met. of Melbourne: 4½ p.c. Deb.	4⅛—4⅜	3⅜—3¾	73/9—75/-
50,000	100	Oct. 1	4½	4½	Montevideo, Ltd.	99—101	95—98	...
341,920	Stk.	Nov. 29	4	4	Newcastle & Gatsh'dCon.	11½—12	50—55	49—53
1,875,892	,,	July 26	4½	4½	Do. 4 p.c. Pref. Stk.	98½—99½	85½—86½d	...
250,166	,,	Aug. 9	—	4	Do. 3½ p.c. Deb.	..	74½—76½d	...
589,705	,,	Dec. 28	3½	3½	North Middlesex 10 p.c.	82—83	72—73*d	...
15,000	10	Aug. 23	—	11	Oriental, Ltd. 7 p.c.	..	16⅛—17⅛	...
75,940	10	,,	7/14/10	7 7/10	Oriental, Ltd.	14—15	11½—12½	...
300,000	Stk.	Nov. 29	8	9	Piym'th & Stonh'se 5 p.c.	117—122	97—102	101
138,120	Stk.	Dec. 28	—	7½	Portsea Island, B	..	105—110	...
60,000	50	Sept. 6	13	13	Do. C	128—131	105—110	107—107½
100,000	50	,,	12	12	Primitiva Ord.	118—121	100—105	...
1,450,345	5	29 Oct. 14	8	—	Do. 5 p.c. Pref.	5⅛—6	⅛—⅛	5/6—6/3
2,499,800	5	30 Dec. 15	5	—	Do. 4 p.c. Deb.	4¼—5	1⅛—1⅜	21/3—24/-
341,400	100	Dec. 3	4	4	Do. ,, ,, 1911	91—93	70—75	...
600,000	Stk.	July 26	4	4	Do. B. Aires 4 p.c Deb.	..	55—58	...
220,335	,,	Dec. 28	4	4	Do. Riv. Pl. 4 p.c. Deb.	85—87	55—58	...
321,670	,,	,,	4	4	San Paulo: 6 p.c. Pref.	85—87	55—58	55⅛—56
130,000	10	Oct. 4	6	6	San Paulo: 5 p.c. Deb.	10½—11	5¼—6	...
135,000	50	Jan. 2	5	5	Sheffield A	47—49	37—40	...
270,000	Stk.	Aug. 23	10	5	Do. B	223—224	100—102e	...
419,968	,,	,,	10	5	Do. C	222—224	100—102e	...
1,047,000	,,	,,	10		Shrewsbury 5 p.c.	220—222	99—101e	...
133,201	Stk.	—	4		South African	..	..	...
90,000	10	Oct. 18	9	6	South Met. Ord.	10½—11½	7—9	...
5,009,895	Stk.	July 26	5/9/4	5	Do. Red. Pref.	111—113	91—94	91½—93
250,000	,,	Jan. 10	—	5	Do. 5 p.c. Deb.	..	97—99*	...
1,895,445	,,	,,	3	3	Do. 6½ p.c. Deb.	72½—74½	57—60*	58
734,000	,,	Sept. 6	—	6½	South Shields Con. Stk.	..	104—106	104—105⅜
91,500	,,	Aug. 23	8½	8½	S'th Suburb'n Ord. 5 p.c.	137—139	134—136d	...
1,087,795	,,	,,	6	6	Do. 5 p.c. Deb. Stk.	114—116	99—102	99½
368,837	,,	Dec. 28	5	5	S'th'mpt'n Ord. 5p.c. max	116—118	95—100	...
647,740	,,	Nov. 15	5	5	Do. 4 p.c. Deb. Stk.	99—102	85—90	...
121,275	,,	Dec. 28	4	4	Swansea 7 p.c. Pref. Stk.	..	74—79	...
250,000	,,	Aug. 23	—	7	Do. 6½ p.c. Deb. Stk.	..	102—104	102½—103
800,000	,,	Dec. 28	—	6½	Tottenham District: A 5 p.c.	..	102—104	103
120,000	,,	July 26	—	8	Tottenham District: B 3½ p.c.	135—138	122—127	...
782,275	,,	,,	6	6½	Tottenham District: 4 p.c. Deb.	115—117	100—105	101—101½
181,255	,,	Dec. 13	4	4	Tynemouth 5 p.c. max.	87—89	77—81	...
258,251	Stk.	Aug. 23	5	5	Wandsworth, Wimbledon, and Epsom—Wandsworth A 5 p.c.	108½—109	89—91d	...
30,000	,,	July 12	8½	9	Do. B 3½ p.c.	151—156	132—137	...
253,636	,,	,,	6½	7½	Do. C.	129—134	110—115	111
108,075	,,	,,	5/17/3	6 10/0	New Ordinary	110—115	98—103	...
140,865	,,	,,	—	6 10/0	Wimbledon 5 p.c.	..	..	...
352,000	,,	,,	6½	7½	Epsom 5 p.c.	117—122	105—110	...
98,000	,,	,,	6½	7½	5 p.c Deb. Stk.	121—126	110—115	...
88,416	,,	Dec. 28	5	5		66—69	56—61*	...

Quotations at:—*a.*—Bristol. *b.*—Liverpool. *c.*—Nottingham. *d.*—Newcastle. *e.*—Sheffield. * Ex div.

TRADE NOTES.

British Empire Exhibition.

The water-meters to be employed throughout the grounds and on exhibitors' stands at the forthcoming British Empire Exhibition are to be supplied by Messrs. George Kent, Ltd., of London and Luton.

Another Calendar for 1924.

In the "JOURNAL" for Jan. 2, p. 42, we acknowledged the receipt of many useful calendars for 1924. Another which has reached us is that of the Whessoe Foundry and Engineering Company, Ltd., of Darlington, and this displays a fine aerial view of the Company's works.

Metal Surrounds.

A pleasing little booklet has been issued by Messrs. F. Turner, of Birmingham, in which their art-metal mantelpieces and surrounds are well illustrated. Excellent examples are shown suitable for all types of gas-fire; and all have a simplicity very much in keeping with the fires depicted.

"Stanton" Productions.

The Stanton Ironworks Company, Ltd., have issued in pamphlet form a series of photographs which illustrate various phases in the manufacture of their widely-known spun iron pipes. That recognition is given to sound workmanship and reliable material is evident from the fact that, owing to heavy demand, the firm are at present unable to execute orders from stock.

Messrs. W. G. Beaumont and Son.

Acknowledgment has to be made of the receipt from Messrs. W. G. Beaumont and Son, Priory Works, Bow, E., of an attractively got up and practical Year Book and Diary for 1924. The firm carry out a great deal of painting work for the gas industry—and have done so for many years past—and, in addition to numerous tables, the diary includes a number of photographs of plants at different works which Messrs. Beaumont have treated in this way. These are proof of great and varied experience.

Automatic Control in Coal Handling.

This is the title of new and distinctive literature prepared by Messrs. Drakes, Ltd., of Halifax, relating to the advantages of coal-handling plant manufactured by the firm. The outstanding characteristic of the "Drakes" coal breaker, it is claimed, is its strength; also, the whole moving series of breakers, elevators, and conveyors is under automatic control. If an overload or obstruction happens to any individual piece of plant, it stops and automatically cuts out the apparatus preceding it. The plant succeeding the stoppage runs on and clears itself.

Lurgan Gas-Works.—The Lurgan Urban Council have received intimation from the Northern Ireland Home Affairs Ministry sanctioning a loan of £20,000 for the paying-off of mortgages on the municipal gas-works. It was reported that at the end of 1923 there was a credit balance of £4782 on the gas undertaking.

Price of Gas at Southmolton.—At a meeting of the Southmolton Town Council, the Mayor (Dr. Mortimer) presiding, Mr. W. N. Howe, on behalf of the Gas Committee, said it was recommended that the price of gas be reduced to 5s. per 1000 c.ft. as from Dec. 1 last. Mr. Howe said he was by no means satisfied that they could provide gas at 5s.; and Mr. A. Braddick (Manager of the works) said it would not be possible to do so. Mr. Howe stated that there would probably be a loss of about £350 a year. Mr. T. H. Vicary remarked that, if the price were fixed at 5s., there would be no discount. On the proposition of the Mayor, it was decided to discuss the subject in committee.

Twenty "D" shares of £10 each in the Willenhall Gas Company, paying about 8 p.ct., offered for sale locally last week, realized £350.

The fusing of cables in a manhole was responsible for an interruption of the electric supply over a wide area of Acton for about two hours last Saturday night.

In spite of the recent further depreciation in the value of the franc, the Directors of the European Gas Company, Ltd., have decided to pay, on Feb. 1, an interim dividend of 2s. per share, free of income-tax.

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